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Methods of Research in Industrial Relations

Report of the First Washington Conference

By W. V. Bingham, *Personnel Research Federation*

THE recent conference on research methods in industrial relations illustrates well one of the prime functions of the Personnel Research Federation. At this conference, held in the board room of the National Research Council in Washington on May 22, representatives of several of the social and natural sciences met with representatives of organized labor, of employers' counsel and of social and governmental agencies, to hear accounts of the methods used in recent studies of human relations in industry and to criticize these methods candidly and constructively, to the end that the tools of research in this controversial field may be made increasingly more effective and trustworthy.

A high note was struck by Alfred D. Flinn, Vice President of Personnel Research Federation, in opening the conference and introducing Joseph H. Willits of the University of Pennsylvania as Chairman. "The primary purpose of the Federation," he said, "is to search for the truth. Let us remember that the truth will appear if we get after it with open mind and with the tools of science. Many of the problems that the Personnel Research Federation has to face come up because they are so closely related with the interests of human life, and it is easy to let them get under our skin. But we must hold in check our prejudices. We are met here, not to discuss any particular investigation, but rather to study methods of investigation. The agenda states the questions we wish to try to answer: 'How can methods and technique of finding the truth about relations between workers, supervisors and employers be made more reliable? How can the facts of human relationships in industry best be found and interpreted without the coloring of bias or pre-conception?'"

Dr. Willits in taking the chair said: "As an undergraduate I once took a course on the Critical Period of American History. I suspect that if some future historian could look back to the present time he would call it the critical period in social research. He would record the fact that much has been accomplished through research in the physical and natural sciences, and that society has decided that at least equal results are to be achieved by similar research in industrial relations and in other branches of the social sciences. I think he would say that we had before us not only great promises but also a great danger, because industrial research has become the thing to do, and our enthusiasm

is not sufficiently balanced by care and humility. He would say that only a small part of the research that we are doing in industry is really entitled to be called scientific research, and would show how very little progress in the direction of increased areas of quantitative determination we have made. He would point out that in much of our industrial research the attitude of the investigator is much more of a clew to the conclusions than the methods are. He would perhaps record the fact that we are running a risk of reaction because of these deficiencies that would set back the development of industrial research many decades. If that be a true prediction, certainly it is the concern of all of us here. We cannot be in the position of watching the catastrophe happen."

The first formal paper was by Miss Mary Van Kleeck, Director of the Department of Industrial Studies of the Russell Sage Foundation, who spoke on "Procedure Followed in Studying the Industrial Representation Plan of the Colorado Fuel and Iron Company." She laid before the conference the procedures used in planning the investigation, in defining the problem, in setting up standards of evaluation, in defining the specific subject of inquiry and in determining the sources of information. The successive steps taken in carrying out the investigation were described, including the procedure followed in preparing the report. This permitted Miss Van Kleeck to formulate concretely the outstanding questions of research method—particularly with reference to uses and limitations of the personal interview, of documentary material and statistics, and of actual experiment in industral relations. This notable paper is published in full in this number of the JOURNAL OF PERSONNEL RESEARCH. A comprehensive abstract, distributed in advance of the conference helped greatly in focussing discussion on crucial issues.

Professor David A. McCabe, of Princeton University was next to speak:

"We are expected to discuss," he said, "the general question of method in scientific investigation in industrial relations, not the specific findings of the Russell Sage Foundation investigators. Miss Van Kleeck's paper has presented the problems and charted the difficulties with frankness and clarity. I, for one, wish to express my indebtedness to her.

"I agree heartily that the interview is an important part of our scientific equipment. Documentary evidence is far more satisfactory as a source, but much escapes the documentary records that we must know. I have found this to be true of studies of trade union policies, the working of joint trade agreements, and the operation of industrial arbitration, mediation and investigation. The interview is far more necessary in studying the workings of employee representation plans. The printed and manuscript records, taken alone, give the investigator but a maimed conception of what is done and why.

"We have gathered at Princeton a valuable collection of materials on direct relations between the employer and his employees. Our collection is not confined to that phase of industrial relations but material of that type is

an important part of it. We aim to make it as complete as possible. But I am convinced that a study of these records does not in and of itself tell us all that we should know. It must be supplemented by letters and interviews to get the whole picture. In the case of a trade union study, the official records—the reports of the officers, (both of the unions and of the employers associations), the minutes of conferences, the union journals, etc.—give more than do the records available on most plans of direct relations. The attitudes and reasons for the policies pursued come out much more clearly, for both the employers' and the workers' organizations. Minority viewpoints and desires within the union appear in resolutions presented at conventions and in communications to the union journal. It is hard, if not impossible, to get this from the material in type on an employee representation plan. The workers have not organs of expression of the same character.

"For some time to come there will doubtless be differences of opinion as to the value of conclusions based on interview. The selection of persons to be interviewed, the selection of the questions to be asked, the impressions obtained from the answers, the quantitative appraisal of the various attitudes, the distribution of emphasis in summarizing the answers obtained, all involve so much of the subjective that one's acceptance of the conclusions reached will depend upon one's estimate of the ability and impartiality of the investigator. I am afraid that that is inevitable.

"The investigator should be careful in presenting his findings to make very clear in his references exactly where and how and, if in fairness it can be included, from whom he received the data. Documentary evidence should be clearly distinguished from statements made verbally, and if the name of the person interviewed cannot, for obvious reasons be revealed, his connection with the situation in question ought to be stated. The reader must be allowed to exercise his own judgment as to the value of the evidence. That which rests on the general impression of the investigator—and often these impressions are valuable—should be so accredited.

"Thus we come back to the qualifications of the investigator and his devotion to truth. May I not suggest that the universities can be of help in training persons who will come up to these requirements? We, at Princeton at any rate, cannot undertake such big studies as that so well outlined for us by Miss Van Kleeck. But we can, I hope, do our bit to train persons who will have a driving interest in the problems we are discussing, who will be able to appraise the significance of the facts that emerge and who, above all, will have the truly impartial, scientific attitude toward their work."

The problem of the best methods of arriving at the truth about relations between employees and employers was then approached by Mr. Glenn A. Bowers from the vantage point of the industrial relations counsel. Familiar with conditions in the Colorado Fuel and Iron Company studied by the investigators of the Russell Sage Foundation, he called attention to what he considered discrepancies between their

scientific ideals—with which he was in almost entire agreement—and procedures followed in preparation of their report. The relative importance of employee attitudes as ascertained by means of the interview was called in question and other issues of method in industrial relations research were brought to a focus in a thoughtful paper published in full in this number of the Journal of Personnel Research.

Mr. Frank Morrison, Secretary of the American Federation of Labor began by outlining succinctly what trade unions have accomplished in the last seventy-five years in giving the workers courage to declare war against wrongs, to demand a free educational system, to insist on the elimination of child labor, to eliminate the payment in company money for wages, to insist on shorter hours, higher wages, etc., and also in creating and developing independence and manhood among the workers. He contrasted the type of representation a trade union member has with that in a company-controlled union, and spoke favorably of the Russell Sage investigators because they had brought to light the hesitancy of the workers to come forward with their grievances and other matters of interest to them, under an industrial representation plan. He recognized how difficult it is to get the worker's attitude and to find out whether or not his behavior represents just how he feels. Research that will make it possible to do this is going to be helpful.

Objective analyses or determinations were considered by several speakers, notably Prof. C. S. Yoakum of the University of Michigan Dr. Ethelbert Stewart, Chief of the United States Bureau of Labor Statistics, Mr. Louis Levine of the Institute of Economics and Mr. Robert B. Wolf of the New York School of Social Work. "An Example of Statistical Method" written by Prof. William E. Berridge of Brown University, was read by Professor David A. Craig, of the University of Pittsburgh. This paper, which is published in full, develops various barometric measures not only of economic conditions, but also of certain psychological aspects of the constantly changing industrial situation.

Mr. Whiting Williams of Cleveland, and Mr. Fred Telford of the Bureau of Public Personnel Administration spoke of the limitations of the standard interview and of the questionnaire, and Dr. R. S. Woodworth read a paper on "Psychological Experience with the Interview as a Means of Gathering Data" which is also published in this number of the JOURNAL.

Professor Leonard D. White described the methods used in an investigation of Morale of Employees of the City Hall, Chicago, a study which will appear in book form.

Dr. C. R. Mann of the American Council on Education said, "The question of terminology seems to me one of the most important topics in the whole discussion. We have emphasized the interview as a means of research and the importance of developing a technique for interviews. I would like to stand for the thesis that all of these problems can be related to one, and we can begin to make progress in solving the whole thing if we begin at the bottom and consider what is our fundamental terminology.

"For the last twenty years I have been working with this problem of method and the question of scientific training. We have begun to make some real progress in this matter of technical and scientific training by attacking it from the point of view of the elemental terminology of the situation. We have taken up the question of what is it that a workman who is called by a particular name actually does. We have written what we call "job specifications" so that firms employing workers could use the same name for the same sort of work. We have not only settled upon names for the skilled worker. Out of that have come many more questions as to attitude and relations of skilled workers.

"So I suggest as useful procedure in getting the relationship between all these problems the outlining of a series of progressive steps, and the things that must be done to take those steps. We can then discuss how the material can be organized, but without it discussion can be only in general terms and cannot get very far in solving practical problems."

Dr. H. C. Metcalf of the Bureau of Personnel Administration, Dr. Edward E. Hunt of the United States Department of Commerce and Dr. Maynard M. Metcalf of the National Research Council took leading parts in the further discussion. Altogether, sixty-nine people representing nearly as many groups or industries were present.

In closing the conference, the Director of the Personnel Research Federation said, "We are agreed on one point, that industrial relations is a complex, difficult and very important subject. Human relations in industry are of tremendous moment to such a large part of the population that the adjustments called for need the common efforts of the best intellects in all the related branches of science and business. The National Research Council and the Personnel Research Federation stand for the attempt to get the facts, and to let the logic of the facts lead to conclusions apart from any personal bias. It is frankly a question whether the scientific attitude alone can solve questions in the industrial relations field. Can such an approach bring about results of value to social progress? Most of us have a certain amount of faith in the scientific way. So we have asked this group to come together, first to examine typical studies of relations in industry, and second, to define certain issues with reference to the methods which have been used in these studies. Out of this should come not only a clearer awareness on the part of the investigator of points that must be watched in research, but also a challenge to scientists who have developed techniques in other fields, to pass on to us such methods as may profitably be adopted or tried out in industrial relations investigations. There must be a continuing and organized attack on these issues of research method."

A resolution addressed to the officers of the Personnel Research Federation was unanimously adopted, urging the appointment of a Committee on Methods of Research on Industrial Relations to carry on the work of the conference during the coming year. Such a committee has been authorized,

and invitations to serve have been sent to the following:

Prof. Wesley C. Mitchell, National Bureau of Economic Research, New York City.

Mr. Glenn A. Bowers, Curtis, Fosdick and Belknap, New York City.

Prof. John R. Commons, University of Wisconsin.

Dr. Harlow S. Person, Taylor Society, New York.

Miss Florence Thorne, American Federation of Labor, Washington, D. C.

Miss Mary Van Kleeck, Russell Sage Foundation, New York City.

Dr. Clark Wissler, American Museum of Natural History, New York City.

Dr. R. S. Woodworth, National Research Council, Washington, D. C.

Procedure Followed in Studying the Industrial Representation Plan of the Colorado Fuel and Iron Company[1]

A Report to the Personnel Research Federation, May 22, 1925

By Mary Van Kleeck, *Director of the Department of Industrial Studies of the Russell Sage Foundation*

IN THIS sub-title, A Report to the Personnel Research Federation, I have in mind defining the spirit and purpose of this statement, and also suggesting the desirability of investigators' reporting their procedure to the Federation in the future. We must all agree that research applied to human relations in industry is new, undeveloped, and relatively crude. Investigators at work in it need opportunities to make reports to colleagues in this and in allied fields of study for the purpose of developing more consciously precise methods. Yet, except in university seminars, opportunities of this kind have been so rare as to be almost unique, and the seminars aid us only if we are still candidates for degrees. In social research, certainly, we need what Bacon desired as between universities,—"intelligence mutual," and that they should "have a kind of contract, fraternity, and correspondence one with the other."

For the most part those who read the reports of investigations of industrial relations—even those who review them in scientific journals—give attention only to the subject matter, and judge the value of the study by its conclusions and not by its method. Moreover, because the subject matter is exciting—"controversial" as it is called—having to do with struggles and conflicts between groups, the danger is that readers, even those not directly involved, will judge of its quality by its conclusions, rather than by the procedure or the method of securing and recording the facts. The judgment of its conclusions is all too likely to depend upon their value as ammunition to one side or another in a conflict for group dominance.

We need not pause at this point to discuss whether the ultimate test

[1] The report of this investigation has been published by the Russell Sage Foundation, New York, with the title Employes' Representation in Coal Mines, a Study of the Industrial Representation Plan of the Colorado Fuel and Iron Company, by Ben M. Selekman and Mary Van Kleeck, 1924. A similar study of the plan in the steel works of the company has been published with the title, Employes' Representation in Steel Works, by Ben M. Selekman, 1924.

of reliability in the findings of investigators is the degree to which they actually prove usable as a basis for action. The point is that this meeting under the auspices of the Personnel Research Federation to discuss the reliability of certain recent social studies in industry is a unique and welcome opportunity to consider judgments of reliability based upon procedure; including definition of problem for study, determination of standards of evaluation, choice of methods and skill in their use, and checks upon accuracy, as distinct from conclusions, or even from the subject of study, except as the subject establishes conditions to which procedure must be adapted.

In that connection, I may refer to the disadvantage of the fact that the subject which we have been investigating, the Industrial Representation Plan of the Colorado Fuel and Iron Company, is generally known only as the "Rockefeller Plan." For many the very name creates at once an attitude which may be a prejudgment. I almost wish that it were possible without confusion to refer to the operation of employes' representation as x, to the authors of the plan, the present Premier of Canada, and Mr. Rockefeller, as a and a', to the company officials as b, and the miners and the steel workers as c and d, and, shall I add?, the investigators as y and z, algebraic symbols of unknown factors. Picturesqueness is a snare in social research. I hope that we may avoid it in all of its manifold forms on this occasion and treat the subject with the restful confidence of the mathematicians, whose detachment and complete reliance upon the objective method are so great that, as Bertrand Russell once said,[2] "Mathematics may be defined as the subject in which we never know what we are talking about" (once we have accepted a definition of our starting point) "nor whether what we are saying is true" (but only whether each step is precisely in conformity with demon strated mathematical law). Their precision is, at present, quite beyond our grasp, but their detachment and objectivity should be attainable. Indeed the more "controversial" and "human" the subject, the more vital is the need for dispassionate consideration of reliability in procedure.

To express so large a hope for this conference is, perhaps, to imply that I attach undue importance to the procedure followed by us in our study of employes' representation in the Colorado Fuel and Iron Company, which is to serve to introduce the subject. On the contrary, it is because I am so keenly aware that our procedure raises questions rather than answers them that I venture the attempt so to formulate the questions as to give a starting point for the day's discussions. I cannot hope that you will devote a great deal of time to the particular problems arising in the series of studies now being carried on by the Department of Industrial Studies of the Russell Sage Foundation, but I should like to say at the outset that such attention as you will give to us, whether it be favorable or adverse, will never be regarded by us as other

[2] Recent Work in the Principles of Mathematics, by Bertrand Russell, in International Monthly, July, 1901.

than friendly. Indeed in proportion as adverse criticism is harder work for the critic than is favorable comment, it will seem to us to be the more friendly. Its importance for this conference, of course, will consist in its contribution toward an answer to the central question, How is it possible to build up a science, "a systematic body of things known" about human relations in industry?

THE INDUSTRIAL RELATIONS SERIES OF THE RUSSELL SAGE FOUNDATION

The Industrial Representation Plan of the Colorado Fuel and Iron Company in its coal mines and its steel works constitutes the subject of two of the first five intensive studies in a series on human relations in industry, undertaken by the Department of Industrial Studies of the Russell Sage Foundation in 1919. The purpose of the series as defined in the working plan developed in preparation for the field work was:

> "To make an accurate and impartial record of typical experiences in industry in the United States in securing for the workers a voice in determining the conditions of their employment, with a view to giving a basis for constructive action by employers and workers in improving industrial relations."[3]

[3] It should be emphasized that this was a working definition made before the investigation began. We would change it, if we were to rewrite it now, in the light of subsequent study, and greater clarification in the method of approach. It would be more satisfactory to us now if expressed in this way: "To make an accurate record of selected experiments in industry in the United States in which workers have a voice in determining the conditions of their employment." We record it here in its original form, however, as definitely belonging in a history of actual procedure before making a study, rather than matured consideration after an investigation.

PLACE OF INDUSTRIAL STUDIES IN THE FOUNDATION

What place did such a study have in the work of the Russell Sage Foundation? The purpose of the Foundation as defined in its charter is "the improvement of social and living conditions in the United States." To this end the trustees may adopt whatever means seem best to them from time to time, including grants to other agencies, educational or consultative activities of its own, and research and publication. In its genesis, and the associations of its staff and trustees it has had close affiliation with social work, and many of the problems which it has chosen for research have been brought to it for study by practising social workers. If the analogy be not dangerous, it bears toward social work a relationship similar to that of an institute for medical research toward medical practitioners.

Among the questions brought to the Foundation as soon as it was organized was the problem of women in industry, and for several years its departmental activities included studies of this problem. With the organization of the Women's Bureau in the Federal government, the program of industrial studies in the Foundation was changed to have a broader scope. An analysis of the changing aspects of labor problems following the war seemed to indicate that the emphasis was shifting from conditions of employment to wage-earners' participation in determining conditions, and

it was suggested that a series of studies be made of new developments in industrial relations.

Whether the name given to the new center of attention be employes' representation, or shop committees, or works councils, or the new unionism, it seemed probable that this subject would offer an appropriate opportunity for research for an organization interested as is the Russell Sage Foundation in human relationships and in industrial conditions as they affect social and living conditions. Moreover, the Foundation in its publications had previously concerned itself not only with women in industry but with industrial relations in their more general aspects, including notably studies of steel workers and longshoremen, and certain phases of the possible settlement of disputes in public utilities. The new series was made possible, at first, by a special appropriation voted by the trustees of the Foundation. Subsequently it was made part of the regular program covered by the budget for the Department.

PLAN OF THE SERIES

The general plan in the minds of investigators in undertaking the new study of industrial relations was to divide the subject up into a series of units, each of which might be published when completed in a brief monograph. At the end of ten years it might prove desirable to publish a more comprehensive study, leading to more generalized interpretation. Each unit, meanwhile, would be in the nature of an exploratory inquiry; and the analysis of common principles (if any are to be discovered) would be postponed until a sufficient number of preliminary studies had been made to give a basis for more general conclusions. This plan is still in our minds though not finally adopted. Meanwhile the units in the series have yielded data more extensive than could be printed in brief monographs. In view of the scarcity of detailed information on the subject, we have not sought condensation, but we still regard each study, lengthy though it be, merely as one unit in a series.

PROCEDURE IN PLANNING SERIES

Having decided upon the general plan for the series, the steps in procedure were as follows:

I. *Study of printed data*, including, for the most part, outlines of plans adopted in various companies. The movement was too new to have a literature.

II. *Analysis of work of War Labor Board*, as shown in unpublished documents in Washington. Many shop committees had been initiated by the Board as a means of enforcing its awards.

III. *Preliminary first-hand inquiries* in eleven plants within a radius of 100 miles of New York. A report on these was prepared as a basis for outlining the detailed study which was to follow.

IV. *A working outline of investigation* was made on the basis of the report of this preliminary inquiry, defining the purpose, scope, subjects of inquiry, and sources of information. It was, of course, subject to modification in the course of the field work. The outline as adopted in October, 1919, was as follows:

"1. *Purpose.* To make an accurate and impartial record of typical experiences in industry in the

United States in securing for the workers a voice in determining the conditions of their employment, with a view to giving a basis for constructive action by employers and workers in improving industrial relations.

"2. *Scope.* The inquiry will include both the newer developments of shop committees and various forms of collective bargaining initiated by the workers themselves in the trade union movement. For the present attention will be focussed upon these developments in three industries,—coal-mining, the manufacture of steel, and the making of men's clothing.

"3. *Subjects of inquiry.* (This outline is intended to cover not only plans for shop committees in individual establishments, but in general the history and activities of any scheme of collective bargaining.)

a. Origin of plan and circumstances of its inauguration.
b. Outline of the plan.
c. Methods of administration including the relationship of the department administering the plan to the whole corporation and to other departments; the labor policy of the company; and the methods of hiring and assigning employes.
d. Any changes made in the plan as the result of experience.
e. Typical cases handled by representatives of the management, including procedure with reference to grievances.
f. Typical cases handled by representatives of workers and the degree of initiative and responsibility shown by them.
g. Work done by joint committees with a record of cases handled by them.
h. Procedure in dealing with appeals.
i. Labor difficulties and their results since the establishment of the plan.
j. Interest[4] shown by the workers in participating in the plan.
k. Personnel of committees and methods of selection of representatives.
l. Scope of interest[5] of the workers in such subjects as welfare work, housing, recreation, education etc.

"4. *Sources of information.*[6]

a. Interviews with
1′ Company officials.[7]
2′ Elected representatives of the workers

[4] In the processes of field work the evidences of interest were found in (a) proportion voting in elections; (b) number attending general meetings of employes; (c) resort to provisions of plan for adjustment of grievances; (d) activities of employes' representatives in exercising powers given them in the plan.

[5] Evidence of the "scope of interest" in these subjects was found in analyses of the activities of committees dealing with them, and in the share taken by employes' representatives in these activities.

[6] For some reason we omitted "observation" from this outline as a source of information, perhaps because we took it for granted. As a matter of practice, we found it important. It has included (1) inspection of work places, and study of the processes and nature of the work, as they affect conditions of employment and relationships; (2) inspection of living conditions and community life; (3) attendance at meetings, hearings, etc.

[7] Including superintendents and foremen.

in various types of positions in relation to the plan.

3′ Workers typical of the rank and file, who have not held office under the plan.

4′ Residents of the state outside the industry, but in a position to observe results.

b. Documents,[8] including printed material, minutes of meetings, or correspondence."

V. *Selection of the first study* in the series was then made. As the paragraph on "Scope" in the preceding outline shows, we had at first adopted an industrial basis,—intending to concentrate attention first upon coal, steel and clothing. In this we had in mind both the importance of the industries and the experience in industrial relations which they had to offer.

The Industrial Representation Plan of the Colorado Fuel and Iron Company was finally chosen as the first because it had the same plan in both coal and steel; it was the first prominent experiment in employes' representation; our preliminary inquiry had showed that it had been copied by other companies; and it had had a longer history than almost any other of its kind.

VI. In *selecting the other plans* for more or less simultaneous study, we shifted from the industrial basis of choice, and made our selection with reference to the distinctive contribution which each had to offer. We sought variety rather than similarity in experience. Space does not permit the outline of reasons for our choice. It included the Partnership Plan of the Dutchess Bleachery at Wappingers Falls; the Works Council of Rock Island Arsenal; and the Employment and Management Policy of Filene's store. The last two are not yet in print, and no decision has been reached regarding the next steps in the series.

[8] The word "documents" covered all available records, including payrolls, personnel data, and statistical material.

PROCEDURE IN STUDYING THE COLORADO FUEL AND IRON COMPANY

1. Defining the question for investigation

The basis for formulating the question for investigation in the Colorado Fuel and Iron Company was the statement of general purpose of the series already quoted, namely, "to make an accurate and impartial record of typical experiences in industry . . . . in securing for the workers a voice in determining the conditions of their employment, with a view to giving a basis for constructive action by employers and by workers for improving industrial relations." The word "constructive" carries no assumption as to the particular form of the action, provided only it be the result of a conscious plan designed to meet a thoroughly analyzed condition; the word "improving" I beg leave to postpone defining, on the ground that an accumulation of experience is needed to give content to what is now a composite of vague and varying aspirations. These aspirations in the minds of many individuals, though difficult to define, are nevertheless facts for the investigator of industrial relations and some knowledge of their broader manifestations must precede the study of a particular phase, if that single phase is to be adequately investigated. What is

broadly known as "the labor movement" is an illustration. But the attitude of the investigator toward the program of any group in industry must be that of the scientist seeking the truth, not the advocate who holds fast to a conclusion. In short, though the subject of our study be the process of increasing the share of workers in determining the conditions of their employment, we defend no assumption in advance that this is desirable, or necessarily a means of "improving industrial relations." Observing that it is being tried, we undertake to ask, How and with what results? Through study of industrial relationships as they actually exist and change, we may find our definitions of what is desirable for industry, for the personalities concerned in it, and for society.

The specific problem for study in the coal mines of the Colorado Fuel and Iron Company arose out of the definition of the plan itself, the first clause of which reads: "Employes at each of the mining camps shall annually elect from among their number representatives to act on their behalf with respect to matters pertaining to their employment, working and living conditions, the adjustment of differences, and such other matters of mutual concern and interest as relations within the industry may determine." From this beginning the plan expands into provisions for conferences, committees, and machinery for appeals, but the essence of it is the choice by employes of representatives "from among their own number," "to act on their behalf." The central question for investigation then was, *How and with what results, in actual practice, do employes' representatives act on behalf of their fellow-employes?*

A word needs to be added to amplify the definition of the inquiry, because lack of clear understanding of it has already caused confusion, particularly in dealing with representatives of the company. The point of misunderstanding is the distinction between a study of conditions and a study of the workers' share in the process of determining conditions. Not the kind of houses built in the Colorado mining camps, but the participation of employes' representatives in the planning and administering of housing, was the characteristic topic of our investigation; as a sub-head, What kind of houses do employes' representatives share in planning?, is pertinent but not primary.

Another misunderstanding arose out of our including in the study the activities of the United Mine Workers in Colorado, and, in general, the plan of organization of the national union. Representatives of the Company assumed that this emphasis in our study upon the union, which in their opinion did not belong in the inquiry since it was not a party to employes' representation, indicated a bias on the part of our investigators in favor of unions and served only to emphasize the idea of conflict of interest between capital and labor which unionism is said to foster, in contrast with employes' representation, which in this company is founded upon the idea of identity of interest. In including certain phases of the subject of the union in our study, however, we had no choice. Many employes of the company are, or have been, members of

the union, and have worked in union mines. Both company officials and workers watch the activity of the United Mine Workers, and are influenced by them, and from time to time a strike brings unionism very directly into the affairs of the company. In so far as these circumstances had a visible effect upon the actual workings of employes' representation, they became an essential part of our study even though they led us outside the field of operation of employes' representation, which is limited to the company itself.

2. Setting up working standards of evaluation

Our procedure on this point is best explained by a quotation from our published report, taken from Chapter I, The Problem of Employes' Representation (p. 7):

"The accomplishments of a plan for improving human relationships in industry should first be measured by the purposes and objectives of those who have devised it. Has it performed the office genuinely and effectively for which its originators designed it? This is different from asking, Has it accomplished what someone else with another social philosophy than theirs thinks it ought to have accomplished?

" The second and larger question to ask about this or any other social instrument is, What social utility does it possess, measured both by the purposes of its originators, and by its actual results?"[9]

We sought definition of the purposes and objectives of the originators and the administrators in (1) the plan itself; (2) published statements about it by representatives of the company; (3) statements made to us in interviews with representatives of the company. Briefly this resulted in setting up this working standard: *The effective operation of employes' representation is its habitual use by employes, by their representatives, and by company officials to restore personal relationships as a means of avoiding the suspicions and friction of large-scale operations; to adjust grievances promptly and satisfactorily; to give workers' representatives a voice in "matters pertaining to employment, working and living conditions, the adjustment of differences and such other matters of mutual concern and interest as relations within the industry may determine"; and to lay the basis for the development of "an industrial constitution," or a code of accepted principles and practice governing industrial relations, and the necessary machinery for building it up and enforcing it.*

3. Defining specific subject of inquiry

The subjects of inquiry outlined in the general plan of the series gave the main heads for the Colorado study (see page 136). This outline was, of course, modified and amplified substantially after field work had showed the need for change in emphasis, and after we were more familiar with the various sources of information.

4. Determing sources of information

We anticipated, in preliminary planning, that our sources of information

[9] This question cannot be fully answered without study of other plans and of conditions and problems outside the particular situation. It belongs in the more comprehensive study to come later in a series of investigations.

would fall into familiar categories: (1) reports in the offices of the company, including minutes of meetings and conferences, correspondence and other material bearing on the operation of the plan; (2) records of personnel and employment, including pay-rolls, and whatever form of reports the company might have adopted showing fluctuations or regularity of employment, changes in personnel, length of service, and, in general, individual histories; (3) statements of individuals having information to give, including representatives of all the varied groups having a relation to the plan; (4) observation, including inspections of mines and camps and attendance at meetings.

The records in group (2) were most disappointing, particularly personnel records—including all that goes to make up an analysis of labor turnover. These were not in shape for use. Unquestionably, if available, they would have supplied data important for our purpose, but the difficulty of having to bring the material for them together, (and even to have some of it collected from the workers themselves) seemed too great to be justified. Wage data, while available and supplied to us, were not essential to our study which had to do primarily with the procedure for setting wages rather than with the wages actually paid, and we did not compile it for publication.

It was our task to record the activities of groups concerned in employes' representation—to observe whether and how it was habitually used. Minutes and reports were useful, but we speedily found that much of the information essential to the study was nowhere recorded. It must be obtained through interviews with individuals, supplemented at certain points through observation of conditions in the mines. We were without the sense of security which duly recorded data afford, particularly when they are susceptible of statistical treatment. Moreover, we were soon brought face to face with the difficulty of recording and verifying the negative. Minutes and reports would show no grievances in a given camp. Miners in that camp would voice their discontent to us, and give us specifications. They had not asked their representatives to act for them. Foremen and superintendents had received no formal complaint. Higher officials had had no appeal. Only the miners themselves could be our source of information on this point, and no verification in documents would be possible. Yet obviously, if one is studying the adjustment of grievances as one of the functions of employes' representation, grievances unadjusted and uncomplained of cannot be ignored. Interviews with individuals and with groups become an exceedingly important source of information. Interviews were, also, essential to give detail as to procedure and its results in cases already recorded in minutes or reports but not always described there in such a way as to give the data necessary in this investigation.

5. Outline of procedure

a. Preliminary arrangements: Our object was not only to make a beginning but to secure at once the co-operation of all who were related in any way to the

operation of employes' representation in Colorado. Our first approach was to Mr. Rockefeller in New York. He informed the company officials in Denver, and received a reply from them consenting to the investigation. Before receiving their answer the investigator started for Pueblo. The steel workers were on strike. The miners' strike of 1919 had just ended. It seemed important to observe conditions during a period of unrest, as well as in a normal time. On the way, he stopped at the national offices of the United Mine Workers in Indianapolis to inform them of our plans for investigation, and to secure from them any statements or opinions which they might wish to offer.

b. *Approach to workers:* Our first contacts were with the workers and with local officials of the union. This was due, first, to the existence of the strike just noted. Since it was the workers who struck and it was the union which led them, these two were the primary source of information as to the reasons for the strike. Moreover, in planning how best to secure the co-operation of the workers in our investigation, we had to give consideration to these possible influences: Industrial relations throughout the mining indust r had been disturbed for years. Regardless of goodwill in any one company, employes under these circumstances are likely to be suspicious of their employers, and to withhold frankness from investigators whom they see first accompanied by officials. We had found this to be true in previous investigations in industries in which there is unrest, and we had been advised by previous investigators in Colorado that we were more likely to succeed in convincing the employes there that we were disinterested if we went to them first. This is not a reflection upon company officials or workers, but simply a safeguard in planning an investigation in which such circumstances may have no influence.[10] We felt more free to proceed in this way because, through Mr. Rockefeller, the company had already been advised of our intention to make the study.

c. *Hearings of Industrial Commission:* This was a step not planned in advance. The hearings dealt with cases growing out of the miners' strike, particularly the alleged refusal of the company to re-employ men because of their activities in the strike. Finding that the hearings were to be held, the investigator planned to attend them at the same time that he was making the acquaintance of miners in Walsenburg, Trinidad, and their neighboring mines.

d. *Approach to company officials, and study of documentary material:* Some of the officers of the company were met first at the hearings, and the investigator then accompanied them back to the Denver offices where he spent one month studying minutes and other documentary material, and interviewing officials.

e. *Inspection of mines and interviews in the field:* He then returned to the camps, visiting them all—some several times—and inspecting typical mines, while continuing interviews with miners, foremen and superintendents. Minutes and reports were frequently consulted during the course of the field work, which, of course, was not divided chronologically between the different sources of information. Whichever source was needed in the progress of investigation of a particular case, was utilized.

f. *Steps in verification:* The procedure for verifying statements included several steps. If a case were first encountered in reading minutes and if additional

[10] That it is not a general principle but depends upon circumstances is shown by our experience in investigating Filene's store. Our investigator there reports that she would have failed to secure the co-operation of employes had her approach to them not been sponsored by the firm.

data seemed necessary, note was made of the circumstances of the case and the names of those involved, and these were then interviewed. If the case were mentioned first by a miner, watch was kept for reports of it by other miners. Foremen and superintendents were questioned about the conditions which would have given rise to complaints made by miners, though the names of these employes were never mentioned by the investigator unless the case were so well-known that mention of names was no breach of confidence. Minutes and other documents were then examined for information on the case. If it were a grievance involving conditions in the mines, inspection was made if the condition were current, or if the problem involved were one which could be clarified by observation in the mine. Finally if the matter had come to the attention of higher officials, or if more information on some phase of it was needed, facts were sought from them.

g. Source material summarized: In the preliminary field work the documentary material obtained from the company included minutes of joint committees, district conferences, annual meetings and special meetings; annual reports of committees; notices to employes; records of votes; lists of employes' representatives; correspondence of superintendents, officers and "president's industrial representatives" who administer the plan; reports of president's industrial representatives; printed rules; samples of record forms relating to employment, blanks for reports, ballots for election of employes' representatives and lease for miners' houses; wage scales; and statistics of output and force at work during strike of 1919. In addition we secured copies of hearings and correspondence from the Colorado Industrial Commission; material from the United Mine Workers, and a considerable number of official reports relating to coal miners in Colorado, besides articles and pamphlets from other sources.

The number interviewed in the preliminary investigation was as follows:

1. Employes[11] in the mines, including representatives—every mine of the company being represented in the group.....	160
2. Superintendents, foremen and assistant foremen.....	29
3. Higher officials.....	12
4. Officers of United Mine Workers.	20
5. Other persons outside company.	29
Total interviewed.....	250

h. Securing supplementary data:

(1) *Collaboration of mining engineer:* Many grievances presented for adjustment under the plan, and others not brought up at all, clearly involved technical problems of mine management. Allotment of working places, payment for "dead work," supply of mine cars, are illustrations. Sooner or later the whole movement called employes' representation must be clarified by re-defining the problems of management, and determining the relation of the workers to each of them. In the Colorado study all that we could do was to have the records of our interviews checked by a mining engineer, who was appointed on our staff for that purpose. He, also, went to Colorado, visited certain camps where grievances of this kind had been numerous, and checked the payrolls to determine the range of tonnage produced by the miners—in itself a rough index of technical problems of underground management. The inquiry did not yield sufficient data to stand as a unit for publication. It was used as a

[11] The number here is a minimum, because sometimes workers were interviewed in a group and the exact number was not always recorded. In making the count, we rated such a group as 3, which was probably too low.

check upon the accuracy of the information given us in interviews.

(2) *Study of statistics in the bituminous coal industry:* As the coal mines of Colorado are part of the bituminous coal industry, we felt the need of having as a background an outline of information about employment in the industry as a whole, particularly irregularity of production and its effect upon wages. Available statistics were compiled by a member of our staff and published in a pamphlet called, The Coal Miners' Insecurity (1922).

(3) *Study of the organization of the United Mine Workers:* The United Mine Workers' organization has been an important factor in industrial relations in Colorado coal mines for thirty years. It is in the minds of employes of the Colorado Fuel and Iron Company, many of whom are, or have been, members. It was an appropriate part of our investigation there to compile data regarding the operation of collective agreements between operators and the union in the so-called Central Competitive Field. This information has not been published, as it would require further investigation to complete it as a separate study, but it helped us to understand the situation in Colorado.

i. Preliminary report prepared; criticisms received from company officials: It is always the practice in the Russell Sage Foundation to submit a report before publication to those who are directly related to the subject of investigation, or who would be affected by it, or who have information enabling them to criticize the data. This is not done only in the interest of fairness, though that is a vital consideration. It is, in a sense, part of the field work. Seeing the material as a whole enables employers or workers, for instance, to supply facts whose relevance for the study they had not previously realized. This was particularly true in the Colorado study, as the criticisms of the representatives of the company became the starting point for the second stage of the study, which resulted in a substantial increase in data, and a clearer definition of standards of evaluation. It is difficult to discuss the criticisms made by the company without getting involved in the subject matter of the investigation. Their comments were received at two different stages of the inquiry—after the preliminary manuscript was submitted, and, again, after the final report was in galley proof. For convenience, I outline here the combined criticisms of these two occasions. Unfortunately the essential differences of judgment revealed in the preliminary work were not eliminated in the final report.[12]

They may be grouped as having to do with (1) our choice of this company

[12] Was the failure to secure agreement on the part of the company in the findings of the study of employes' representation in the Colorado Fuel and Iron Company due primarily to the procedure followed or were important steps neglected; or was it inherent in the situation and significant in itself for a study of industrial relations?

An allied question is suggestive of a possible explanation of this failure to secure agreement: Is it desirable to publish a study of a single company with the name attached? I personally believe that the prospect of publication prevented impersonal judgment of the validity of the findings on the part of representatives of the company. When the galley proof was submitted to the head of one of the largest companies in the United States, which has had experience with both strikes and employes' representation, he confirmed at many points the statements which officials of the Colorado Fuel and Iron Company had challenged. On the other hand, the study of one company may have the two-fold advantage of unity and approximate completeness.

for investigation on the ground that it is not typical of companies having employes' representation; (2) our definition of the subject of the inquiry;[13] (3) our tests of the effectiveness of the plan; (4) our inclusion of material not considered relevant by the company, particularly the outline of the strike of 1913–14, out of which the plan grew; (5) our reliance upon interviews with workers as sources of information, and particularly our unwillingness to report to the company names of miners involved in cases analyzed by us so that the company could verify them; and (6) in general our interpretation of the whole situation.

Of these the two requiring further amplification for their bearing upon method are (5) and (6).

The general criticism was "that the report is trying to prove a preconceived conclusion, and is neither giving an unbiassed history or coming to an unbiassed conclusion." More specifically, the company expressed the opinion that "representation is being analyzed as a substitute for unionism," and "that the whole report is written from the dominating point of view that workers can never hope to get their rights except through the fighting agency of a union."

Objections to our reliance upon interviews with workers constituted the largest group of adverse criticisms by the company.

Commenting on our statement that names of employes could not be given to company officials because we had assured the workers, as we always do, that their names would be held in confidence, representatives of the company wrote, "Statements quoted in this report, therefore, as being made by employes to investigators are subject to the likelihood of inaccuracy which relates to all one-sided statements, where the other side has had no chance to examine the witnesses, or even to look into the circumstances."

This objection raises the very important question of methods of interviewing, reliability of data thus secured, and checks upon accuracy, all of which will be discussed later.

j. Supplementary study by collaborating investigator: This study was made by a second investigator for the purpose of making an independent examination of points disputed by the company. It was a six weeks' study with extended interviews with company officials, with 64 employes' representatives from 23 mines, and with members of the Colorado Industrial Commission and the State Inspector of Mines; observation of all but two of the company's camps in Colorado and of two typical mines; and study of additional documents. In this supplementary study we obtained an unusually complete record of the points at issue, the process of re-examination, and the discussions between us and the company officials; and these records have become, in a sense, raw material for further study and for verification of previous interviews:

a' Memorandum of conference with four company officials, February 4 to 12, 1921, in which the preliminary report was read aloud from beginning to end, and all points of disagreement defined; notes taken by the investigator and submitted to the president of the company who corrected and approved them (139 typewritten pages).

b' Stenographic report of two days' conference of five company officials with both investigators, March 7 to 8, 1921, at completion of the second

[13] This was a misunderstanding rather than an explicit difference of opinion. The company thought that we were belittling the value of good conditions when after describing them we drew the conclusion that in establishing them the employes' representatives had had little responsibility. It was difficult to make clear that we were studying employes' representation, and not housing or schools.

part of the field work (419 typewritten pages).

c' Memorandum, in parallel columns:—comments of representatives of the company on the final report, submitted in galley proof, and our reply on each point. The company's comments were prepared by Mr. Rockefeller and his representatives in New York, acting on behalf of the company officials in Colorado (105 typewritten pages. Date of our reply, February, 1924.)

Before leaving Colorado, the second investigator reported verbally to certain employes' representatives and to union officials our main findings and conclusions. On the whole, they confirmed our data. We did not submit the manuscript or the proof because of the difficulty of getting their comments at long range. Both manuscript and proof were submitted to officers of the United Mine Workers, including Colorado representatives, and they too confirmed the findings.

k. An illustrative case: The steps taken in the investigation of the case of two miners at Coal Creek (described in the published report pages 168–176), will illustrate procedure in field work, the combined use of interviews and documentary material, and the relation beween the two parts of the study. The investigation was more extended than in the majority of cases studied, but the method of procedure is illustrative:

1. Case mentioned to first investigator by a former employes' representative at Coal Creek (one of the mines of the company), who was interviewed on February 24, 1920.
2. Case mentioned and described by another employes' representative, February 26, 1920. He supplied a copy of the report of the president's industrial representative on the case. The investigator then remembered having seen this report in the files of the two industrial representatives of the president, to which the company had given him access before he went to the mines, but he had not noted its significance until the miners called his attention to it.
3. Several other miners interviewed on the same visit mentioned the case.
4. Case described by the president's industrial representative in an interview with the investigator at Canon City, Colorado (not far from Coal Creek), February 29, 1920.
5. Case discussed, with other matters, with the superintendent of Coal Creek on March 1, 1920.
6. Case discussed by the general manager of the Fuel Department of the company when the investigator interviewed him on April 7, 1920.
7. Manuscript of investigator's preliminary report, containing his description of this case read aloud in the president's office in Denver on February 7, 1921, and the company's objections noted by the second investigator. This memorandum was corrected by the president in conference with the second investigator a few days later in Pueblo.
8. The second investigator interviewed the employes' representatives of 1921 and other miners of Coal Creek and Rockvale, the adjoining mine, at Rockvale, Colorado, on February 22, 1921. In the group were the two employes' representatives who had been involved in this case. They brought the matter up on their own initiative.
9. In the afternoon at the suggestion of the general manager of the Fuel Department, the second investigator had a conference on this case at Rockvale, at which there were present the general manager, the superintendent, the two employes' representatives involved in the case, a former employes' representative, and one of the two miners involved.

The results of this conference are included in the stenographic record

of the final conference with the company, at the close of the second investigation.

10. Both investigators interviewed the Chief Mine Inspector of Colorado, in the Capitol Building, Denver, on March 5, 1921, and the legal point raised in this case was thoroughly discussed.

l. Chronology of investigation:

Field work of first investigator in Colorado—November, 1919, to April, 1920.

Analysis of data and preparation of first draft of report—April to November, 1920.

Manuscript in hands of representatives of company—November, 1920, to February, 1921.

Manuscript submitted to officers of United Mine Workers—December, 1920.

Conferences with company officials and field work in Colorado by second investigator—February 1, to March 8, 1921.

Data completely analyzed again—manuscript rewritten by two investigators in collaboration—March, 1921, to September, 1922.[14]

Manuscript going through process of editing and being put through the press—September, 1922, to April, 1923. Revised galley proofs submitted to representatives of the company—May 5, 1923.

Memorandum giving company's criticism received—December, 1923.

Review of company's criticisms with appropriate changes in galley proof—December, 1923, to February, 1924.

Revised galley submitted to officers of the United Mine Workers, including Colorado representatives, in Indianapolis—January, 1924.

Invitation sent to Mr. Rockefeller to prepare statement for publication with report—January, 1924. Answer received—April, 1924.

Book held for publication with others in series and issued January, 1925.

[14] The work on this report was much interrupted during this period by the service of the director on the President's Conference on Unemployment and the Hoover Committee on the Business Cycle, and field work on other studies in the industrial relations series.

6. The interview as a method of investigation

a. Purpose: The purpose of the interview in this study was primarily to secure from officials and workers concrete information which they were in a position to give concerning the operation of employes' representation, particularly their own activities in connection with it. As a by-product of these conversations, they told us their opinions, past experiences, ideas and suspicions, some of which were groundless as facts, but significant as showing attitude of mind.

The primary purpose, however, was only one of several possible uses of the interview.

(1). It may serve as a means of detailed study of the individual and for this purpose the problem of technique is subtle and complicated. (2) It may be designed to win co-operation in the making of an experiment, or in some other phase of research. (3) Its aim may be merely to secure information from the person interviewed, regarding him as a source almost as impersonal as a printed document. (4) It may have the purpose, as was true to some extent in this inquiry, of study of the individual's activities in relation to an institution or a process. The methods will vary for these and other different purposes. Therefore, in describing the methods used in the study we are not assuming that they are applicable to interviews in other

studies, designed to serve other ends. In fact, we do not pretend to have followed a consciously defined method of interviewing in the Colorado study, though we were aware of difficulties and we sought to establish safeguards of accuracy and tests of results.

b. Choice of persons to be interviewed: We included (1) all present employes' representatives; (2) other workers, definitely sought because they were known to have some specific information to give; (3) workers met by chance in every one of the company's camps; (4) superintendents, foremen, and assistant foremen; (5) president's industrial representatives; (6) other officials; (7) officers connected with the union, many of whom were employes of the company. Thus we interviewed (*a*) every man having a definite position in connection with the plan; (*b*) workers from every mine. The force of workers is comparatively small in any one mine, and information is likely to be common property, especially since the camps, also, are small, homogeneous communities. Interviews with a few workers in each of these groups seemed, therefore, to be sufficient to accomplish the purpose of securing information about employes' representation. Had we been studying them as individuals a much larger sampling would have been necessary for any conclusions regarding the whole group of miners.

c. Approach: The officials of the company are so accustomed to visitors who come to make an investigation, that their attitude of ready compliance with requests for information is an established procedure. The essential in approaching either officials or workers is to win their confidence. This we sought to accomplish with the workers, particularly by the following means: (1) By a full and frank statement of who the investigator was, where he came from, what he represented, what he was investigating, and why; (2) by introduction through a fellow-worker, when possible, or, at least, an approach independent of the company in the first investigation, as already explained; in the second investigation, the investigator was introduced by company officials but they always withdrew from the interview; (3) by assurance that the giving of information would result in no harm for the employe, as his name in connection with it would be kept in strict confidence by the investigator, unless he were willing to be quoted; (4) by avoiding usually the taking of notes during the conversation; the notes were made immediately afterward, except under circumstances where a notebook would not restrict the freedom of the interview.

d. Place: Sometimes the interview was in the mine, but when more leisure for conversation was needed it might be in the miner's home, in the camp hotel, or in the Y. M. C. A. Club House.

e. Subjects of inquiry: These in general were the twelve topics outlined in the plan of investigation (page 141), but some of these were more likely than others to be within the worker's knowledge, and some were more appropriate for discussion with officials. They were all in mind in every interview, and in addition the investigator had often outlined specific information which he wished at that time to obtain

from the person interviewed. We tried to find out most about those things on which the person was best informed through his own experience rather than to follow a precisely uniform scheme of questioning. In general, it is probably true that information imparted in the course of a conversation, and not in answer to a question, is more reliable, since it is to that extent uninfluenced by the form of the question. If this be true, a give-and-take discussion, without questions, may often be the most satisfactory interview. The chief effort of the investigator was directed toward securing concrete, verifiable facts about the operation of employes' representation. The importance of the concrete had been impressed upon his mind in his preliminary inquiry regarding shop committees in the East. In his report at that time he wrote, "Like all human beings, employers and workers enjoy talking in general terms. They either praise or condemn their shop committees in vague, general statements. After some urging I find, however, that they usually have concrete instances to relate showing the operation of the system."

f. Group interviews: In the second phase of the investigation when disputed statements in the preliminary report were being checked up by the second, collaborating investigator, the group method of interviewing was used, and greater uniformity in questioning was followed. The groups were small, usually three or four, and most of them were present or past employes' representatives. The following plan of questioning was outlined by the investigator in the course of the field work. They were merely rough notes intended for personal use as a check on the interviews:

"I began always with explaining that I had come from New York from the Russell Sage Foundation which was an organization to make investigations of social and living conditions and to try to improve conditions by publishing reports. I then explained that in the Industrial Department we are investigating labor questions and especially the best ways of organizing the relations between employers and workers, and that we are including shop committees, representation plans and trade unions in our investigations. I usually told them about our investigation of the Works Council at Rock Island Arsenal and I would then tell them about the investigation made by Selekman in Colorado, and that my purpose was to bring the information up-to-date.

"I would then ask the representatives for 1921 whether they had handled any grievances and if so what.

"I would then ask for other illustrations of grievances handled and make special inquiry as to typical instances. I questioned them especially about any grievances having to do with wage rates, and I always asked them not only to describe a grievance but to tell me how it was taken up and what adjustment was made.

"I would then ask how many had worked for the C. F. & I. prior to 1915. Those who had had as long service as this I would ask whether they had noticed any changes since 1915.

"I was careful not to ask them what changes had resulted from the representation plan.

"I then would ask them what the chief complaints of the men in the camps were at present, and then would question them about why these were not taken up as grievances.

"I asked them about the strike of 1919 and whether the men responded with interest and what happened after the strike in the way of re-employing union men. I would then question whether they had been

asked to sign a card for re-employment and what the men thought about it.

"This would usually lead to a discussion of unionism and the strike of 1913–14 would be discussed. But I did not question very much on this point, except to ask them whether they thought that the strike had had any results in the C. F. & I. Co. mines.

"I asked them where the elections of 1921 were held and how much interest was taken in them.

"I asked them about the procedure as to representatives getting ready for a district conference and whether they tried to get instructions from the men as to what they should take up in the conference; whether they call meetings before it or after it to report results.

"I asked whether any of the men were members of district committees, and if they said they were or had been, I asked them to describe the procedure of the committee.

"The guiding principle of my questions was not to ask for opinions or for a conclusion as to causes and effects but to describe concrete instances and definite experiences. I found the men ready to respond on every point except unionism in which I noticed a very definite reluctance to take part in discussing it or in acknowledging any activity."

g. Record of interviews: The form of recording interviews was a typewritten sheet, 5 x 8 inches in size, with the original sent promptly to the New York office to be checked by the director of the department, and a carbon retained by the investigator. They contained the name of the person interviewed, the place and date, and then a report of the interview. The investigator's own conclusions or interpretation of the interview were to be kept quite separate and recorded if important in another report, which would, however, be filed with the interview. The investigator was encouraged to send in, from time to time, his own comments on his findings, but the records of interviews were to be devoted exclusively to a full and accurate report of what had transpired in the course of it, and not to be confused with the investigator's views.

h. Tests of accuracy: The problem which comes to a head in the form of recording the interview but is directly involved in every previous step is how to separate the investigator as reporter from the investigator as interpreter; and how to convince others of the factual character of an interview in contrast with the personal interpretation by which it seems especially in danger of being colored. We have no final answer. The safeguards which we used in this study were as follows: (1) Prompt recording of interviews before they had time to merge into a common impression uncontrolled by the actual details of each conversation; (2) continuous analysis and appraisal of the records by the director of the department, in the New York office; (3) choice of representative group to be interviewed; (4) confirmation of information through documentary material and through observation; (5) confirmation through other interviews; (6) field work by collaborating investigator one year later;[15] (7) submission of manuscript and of galley proof to those who could correct inaccuracies.

i. Need for study of method: Probably all investigators would agree that the interview which is perhaps the most characteristic method of social

[15] The confirmation, obtained from these interviews, of statements made in the same camps to another investigator a year earlier was quite remarkable.

research—one not shared with the physical sciences—demands much more study from the point of view of method than has yet been bestowed upon it. Its use is more extensive than at first appears. Indeed the point of origin of much quantitative material upon which great dependence is placed is, after all, in interviews and not in statistics. Obviously, census data of population, for instance, are derived from nothing but a succession of interviews of a census taker with a householder. Considerable information which appears in personnel records in industrial establishments is derived from interviews. Clearly in the present stage, at least, of study of human relations in industry it is an indispensable and exclusive source for certain kinds of important information. It seems probable that improvement in the methods of the interview is the next and most important advance to be made in the technique of social research.

7. Documentary material and statistics

The scope and use of the interview in a study of human relations in industry is very directly affected by the amount and character of the records kept in an industrial plant. The records in turn reflect the philosophy and procedure of management. Where few records are kept, and the philosophy and procedure of management not clearly defined, too heavy a burden is placed upon the interview as a source of information, and corroboration is the more difficult to secure. From this point of view a plant is really not prepared for an intensive study of human relations unless its personnel policy is organized and adequately supplied with data.

The general problem to be emphasized here is how to bring about the more adequate keeping of records of personnel and relationships in industrial plants which would make possible more exact analysis of the results of experiments in industrial relations. These records are needed not only by the outside student. They are of vital importance to industry itself. Their periodic analysis in some plants has already lessened the number of disappointments for management in its relations with employes.

8. Experiment

This method, which is the primary one in research in physical science, is scarcely considered in social research. Yet experiments are constantly being made in human relations in industry. What is needed to turn them into a method of research is to plan them in a scientific spirit, and to record them. For instance, would it be mere theorizing to suggest the bituminous coal industry as an urgent subject for such an experiment? Why should not the United Mine Workers and the operators undertake an experiment in collective bargaining directed toward a joint attack upon the problems of organization of the industry, with provision for continuous study of the procedure followed and its results?

9. Problems of preparation of report

This is a subject which should have at least as much space devoted to it as has been given to the discussion of field work. All that can be done here is to try to emphasize its importance.

In a sense its essential difficulties are limited to social research; physical science does not share them. You may write about chemistry clearly or obscurely; accurately or carelessly; popularly or technically; but, on the whole the data which you are discussing have an objectivity, a standardized quality, which safeguards an established fact from distortion through the treachery of language. Human relations, however, are not standardized, nor is there any common agreement on the words used to describe them. Accurate observation may be nullified by clumsy writing which fails to convey to the reader what the investigator saw. Clever writing without scrupulous regard for facts may increase the volume of misunderstanding. If there were time, I should like to defend the thesis that the scientist in social research must add to his equipment the skill of the artist who having observed truth knows how to express it truly to others. Zola's Germinal describes grievances and human relations in the coal mines of France with fidelity to be emulated by investigators of employes' representation in the coal mines of Colorado. The power of the artist would sharpen, not distort the scientist's insight into the facts of human relations and their significance.

It is at this point that the whole problem emerges as to the investigator's personality, past experience, point of view, and possible prejudgments or bias. The more previous knowledge the investigator has, and the more keen his interest in human relations and in their improvement, the more successful is he likely to be in winning confidence and securing information from others. Is he, then, in greater danger of seeing in the situation only what he expected or hoped in advance to find? Will his report be "biased" and untrue?

Is not the development of scientific method the only real safeguard?

The investigator may ardently desire change in industrial relations, but if he is to be a scientist he must have decided whole-heartedly that his contribution must be research, which is incompatible with prejudgment, rather than advocacy of a particular program of reform. If action be his primary interest, his investigations become, almost unconsciously, documents in support of his aim. Many such documents have appeared on both sides of the conflict—witness the reports of the Industrial Relations Commission in the Colorado strike of 1913, and at the other extreme the recent report of the National Industrial Conference Board on the Growth of Works Councils in the United States, which contains this statement in the Introduction:

"In the preparation of its studies the National Industrial Conference Board avails itself of the experience and judgment of the business executives who compose its membership and of recognized authorities in special fields in addition to the scientific knowledge and equipment of its research staff. The publications of the Board thus finally represent the result of scientific investigation and broad business experience and the conclusions expressed therein are those of the Conference as a body."[16]

[16] The Growth of Works Councils in the United States—Special Report No. 32, pages iii to iv. National Industrial Conference Board, February, 1925.

Here is the implication that it is legitimate and desirable that a report should contain not only the results of research but that these may be modified by the conclusions of the body to which they are submitted. Surely the only safeguard against bias is to establish such standards of investigation and reporting as shall be in themselves a test at every step of the scientific attitude of the investigator; and to make a sharp distinction between his report and the conclusions of the governing board of the institution under whose auspices he works. Independent work in the name of the investigator is perhaps the best protection against the dilution of his conclusions by the opinions of those who have not made the investigation.

On the other hand, collaboration of investigators is an aid in controlling the bias of any one of them. Since none of us can wholly avoid certain reactions, or assumptions, we are aided to become conscious of them and to control them if we work as part of a group, challenging each other's methods and conclusions.[17]

[17] I have not discussed the very vital subject of the selection and training of investigators, because it seems to me that the development of standards of procedure and method must precede the formulation of the equipment and characteristics needed for successful performance. For the present, we shall probably continue to use persons of widely varied experience and training. If we were to attempt to define three desiderata now, we would suggest (1) training in some branch of physical science and in mathematics; (2) knowledge of economics, sociology, and the past history of industrial relations; and (3) a constantly widening acquaintance with workers and managers in industry.

Meanwhile, certain immediate tests and restraints may be suggested for the preparation of reports of human relations in industry:

(1) The precise definition of the problem to be investigated, which we have suggested as basic in procedure in field work, at once gives unity and precision to the compilation of data and its presentation.

(2) The setting up of standards for evaluation gives stability and control to the point of view. Having a point of view does not render an investigation unscientific if it be clearly defined.

(3) Defined and controlled procedure in field work is the necessary foundation for a clear and well written report.

(4) Generally speaking, more time and effort should be spent in the study of data and the preparation of the report than have been given to the field work. The world seems to expect investigators to be ready with a manuscript as soon as the field work is completed. As a matter of fact the most important part of a study comes after the field work is finished. The field investigation, in a sense, is merely the search; the research is reflection upon it and presentation in a report.

(5) Experience of investigators in handling materials, preparing notes and developing arrangement of subjects should be pooled and analyzed as a step toward a certain measure of standardized procedure and control.

(6) Finally, the question may be raised whether investigators of industrial relations are not in danger of publishing too much and too soon. Should we, perhaps, have something like Bacon's code to conceal discoveries from all but fellow-scientists until they are ripe for announcement? Perhaps we need more reticence in social research in America. But some of us know that when reticence takes the form of delayed publication, it brings upon the investigator an onslaught of criticism, and upon his institution a charge of suppression of truth. We must at least win for investigators some measure of respect for the time taken to analyze and compile information,

and to prepare it for publication, if we are to develop scientific methods in writing of reports.

In short, a social study is not complete until it is embodied in a report, and every step to the end should be subject to analysis as part of the process of research.

10. Questions at issue concerning studies of human relations in industry

(1) Is a preliminary definition of the problem of research as important as we have assumed it to be in this discussion; and how is it possible to set up tentatively at least the characteristics which make a definition of a research problem more conformable to reliable procedure?
(2) How can standards of evaluation best be set up in the investigation of a defined problem?
(3) How can studies of human relations be made without the interview as a source of data? Can we agree, on the contrary, that the interview is bound to remain par excellence, the indispensable tool for the study of human relations?
(4) How can the reliability of data obtained through interviews be increased? How is it possible to insure that data and findings are strictly objective?
(5) Can the point of view or bias of an investigator be eliminated? If not, how can it be defined and controlled?
(6) How best can an investigator be assured an unhampered approach to facts and their interpretation?
(7) What steps can be taken to develop more adequate, basic personnel records in industrial plants?
(8) To what extent may the experimental method be developed in the study of human relations in industry?
(9) How can a common terminology be developed as a basis for analysis and comparison of results?
(10) How can standards of procedure in presentation of research be developed to insure more accurate and more effective reports?
(11) What contribution to method may be expected from psychologists, economists, social case workers, statisticians, biologists, sociologists, anthropologists, and historians?

To return to the study of employes' representation in coal mines in Colorado—it should be made clear that it was not undertaken in a spirit of claiming to belong to any specific branch of scientific inquiry. Its purpose was practical and comparatively immediate. Its importance—its "human interest"—compelled attention to the validity of procedure, but it should be judged as an exploratory inquiry, a single unit in a series, illustrating problems in method, not solving them. Whether it should be classified as social research, I do not know. Whether it would have been better done by psychologists, or engineers, is a question which invites discussion. But one point is clear, that the subject demands the scientific method. We may say of it what Henry Adams said of the scientific method in history (in a letter to the American Historical Association, December 12, 1894):

"That the effort to make history a science may fail is possible, and perhaps probable; but that it should cease, unless for reasons that would cause all science to cease, is not within the range of experience. . . . . Science itself would admit its own failure if it admitted that man, the most important of all its subjects, could not be brought within its range."

Issues in Research Method

Discussion Before the Personnel Research Federation, May 22, 1925

By Glenn A. Bowers, *Curtis, Fosdick and Belknap, New York.*

A LARGE debt is owed Miss Van Kleeck by all of us interested in scientific industrial research for the time, energy and concentrated thought put into the paper here presented. She has set forth a procedure in research involving definition of problems, standards of evaluation, determination of sources, collection and verifying of information, and other phases upon which may conceivably be built a truly scientific method of research in human relations. The frankness of this paper in recognizing weaknesses in existing methods and the most generous spirit in which criticism is invited should make the rest of us content with looking entirely to the future, forgetting entirely the past error of our ways.

I should enjoy the privilege of discussing each of the points made in the paper as to research methods, most of which I would endorse. That process would not only be an imposition on the time of this conference, but could add little of constructive value to the principles already so well stated. Begging your permission, then, I should like to discuss some aspects of the subject on which others may be able to throw yet more light. Whatever ground there may be for contention as to *facts* contained in the Colorado report this is not the time to stand on it. We are here to discuss *methods* as objectively as we know how.

This discussion paper represents solely my own views and should not be interpreted as viewpoints of interested parties. I have not cleared with other parties prior to this meeting. I am, therefore, solely responsible for what is contained herein.

Unfortunately, perhaps, the use of the study of employe representation in the Colorado Fuel and Iron Company as a basis for the present discussion requires us to look to the results of the methods reported to have been used. From reading this excellent exposition by the Director of generally sound procedure one might readily assume that Mr. Selekman's Colorado study was a successful application of it. In some respects this was the case—in others there is ground for doubt. Of these I shall discuss but a single step, yet an all important one, namely, the preparation of the report. Later I shall raise one or two questions dealing with the vantage points of investigators, the value of attitudes as evidence, and the use of the interview method.

However scrupulous may be the care of investigators in assembling information, the reader depends only upon the written report. The recording of evidence in a scientific manner is quite a different thing from the selection of parts of that evidence as typical of situations. Whatever may be said for the propriety of use of interviews as evidence or for the validity of quotations from interviews, the process of selection by the investigator is purely subjective and therefore unscientific. It inherently opens the door to personal bias and is per se unsound.

PREPARATION OF THE REPORT

Form

In a scientific treatise the reader expects to find:

a. A definition of the problem, the standards of evalutation, the premises of the study, etc.

b. The body of facts, set forth without the use of qualitative colorful adjectives.

c. The conclusions.

Such a report is not always interesting reading. It is not aimed at the popular mind.

In the Colorado report, fact, opinion, premises, philosophies and standards of evaluation are inseparably linked one with another. Without the segregation of fact from opinion the reader cannot discern which is fact and which is opinion. He should be given opportunity to form his own judgments, which might be quite different from those of the investigator based upon the same set of facts. Either may be right, depending upon his logic and breadth of experience. The average reader, of course, is little concerned with the opportunity to do his own thinking. He is quite susceptible to the impressions left by a popular statement, such as the Russell Sage reports on Employe Representation in the Colorado Fuel and Iron Company. When the decision was reached to make this report a popular book all hope for a scientific treatment should have been abandoned.

Too much emphasis cannot be placed upon this point of separation of fact from opinion—it is basic in scientific research procedure. It is recognized by the Director in the instructions to the field investigator to record separately the interviews and his interpretations. But the reader of the report is not granted this separate presentation. The failure to keep fact and opinion separate was doubtless the chief reason for failure of the investigators and officials of the company to arrive at an agreed statement of facts.

Time

In an industrial relations survey of the kind here considered approximately the same amount of time is ordinarily required for the preparation of the report as is needed for the field work. Circumstances in many respects beyond the control of the investigators have delayed the publication of the Colorado report until four years after the field observations were completed. This was nearly one-half of the entire life of the plan at the time of the publication. Needless to say the situation in Colorado is not static; it is constantly changing there as elsewhere. The generalizations of the book are for

the most part in the present tense. As a description of present conditions it is four kaleidoscopic years out of date. A delay of such length from whatever cause renders the study an anachronism, valueless as a correct picture of the present situation; regardless of our respective vantage points, it is harmful as "a basis for constructive action by employers and workers in improving industrial relations." This point is not made for the purpose of controverting here the investigator's appraisal of facts, but to direct attention to the unscientific character of such research procedure. From this we should draw the general rule that the scientific method requires among other things, strict adherence to tense used in the published report with reference to evidence and conclusions. Especially is this true in our rapidly evolving human relationships.

Independence of judgment

Doubtless all here will concur in the statement that the scientific method in research permits no interference by interested parties with the interpretations of investigators. The desirability of securing agreement as to facts is also of general acceptance. This may be accomplished either through the joint collection of facts or through the review of the investigator's statement of facts by interested parties who are in possession of pertinent information. In the latter process the investigator who assumes the responsibility for the report must sit in final judgment. My own experience has been that it is possible almost invariably to find a way of stating the situation acceptable to all parties if confidence and sympathetic understanding prevail among them. So much for freedom in the presentation of facts.

Needless to say, there is no place in the scientific method for such sarcasm as the reference to the "Paul Revere" manager who rode horseback through the camps calling for employes to come out and vote.

The responsibilities of interpretation must fall on those who interpret. When one is open-minded he likes to have the reactions of others as tests of his own logic. Who is in a position to evaluate impartially the investigator's deductions? Certainly not the interested parties. Herein lies a questionable procedure in the preparation of the Colorado report. Considerations of policy or of desire to avoid public controversy may dictate such procedure. However, insofar as impersonal analysis is a part of the scientific method, the presentation of resulting opinion of the investigator to interested parties for endorsement or debate would seem to be unscientific.

VANTAGE POINTS OF INVESTIGATORS

The vantage points of those conducting investigations into human relations in industry predetermine, in most cases, the manner in which the survey results are to be presented.

1. The *labor economist* submits his findings to his immediate constituency; sometimes to the public through the press; occasionally to the employer, either directly or through his employes.

2. The *industrial relations counsel* submits his report direct to his employer client, usually as a confidential document.

3. The *social investigator* is more

closely responsible to the public to which his survey report must sooner or later be given, if he as an individual —or as representative of his institution—is to justify himself as a public agent.

4. The *Governmental investigator* owes his responsibility solely to the public and must in most instances, present a published report.

The labor economist and the industrial relations counsel by nature of their service must express opinions and submit recommendations for "next steps" in the development of programs. The social investigator may do likewise, if he chooses; sometimes he does and sometimes he does not. But if he does express opinions he must abandon whatever objective attitudes he has been able to maintain through choice or chance in the investigation, and assume a subjective position. Insofar as scientific assembly and analysis of the facts do not point out through clear logic the future course, the course advanced by the investigator is mere opinion and should be recognized as one based upon unscientific grounds. Opinions of the social investigator whether expressed frankly or by inuendoes draw the approval or disapproval of the public, insofar as economic and social philosophies of the investigator conform to the conceptions of those who read. Where the investigator's motive is reform through sharp criticism, rather than through coöperation and practical constructive suggestions, antagonism is almost certain to result. The public or governmental investigator, by nature of his position, should refrain from partisan viewpoints.

In the collection and presentation of evidence all types of investigators can, even with our present limited experience, follow to a surprising degree of conformity the methods of objectivity, disinterestedness, tolerance, and other attributes of scientific procedure.

Of prime importance, therefore, are the *motives* of persons making the study, as are also their *attitudes* towards the problems met and the *methods* used.

In the case of each type of investigation referred to above the motive might be accepted as "the improvement of human relations and working conditions in industry." Wide variance of opinion there may be, however, as to the means of effecting improvement—or, in fact, as to what changed condition marks an improvement. The answer is a subjective opinion and without scientific foundation. Unless some unanimity can be reached as to the working hypothesis and subsequently a close agreement as to what are the facts to be related by analysis to the hypothesis, no substantial concurrence may be expected in conclusions.

If as labor economists, counsellors, or social investigators we are to get anywhere with our work in industry, we may do it most quickly and effectively through a sympathetic understanding of the industrialists' problems and through the creation of like sympathy and confidence on the part of those responsible, in the scientific character of our methods. We need not obtain full endorsement of our conclusions to command respect for the impartiality of our process of

work. The great value of the scientific method is that its logic is usually so clear as to gain general acceptance for its conclusions. What we need most of all in industrial relations research, is the replacement of popular-mindedness by the scientific attitude.

ATTITUDES AS EVIDENCE

The fundamental question might here be raised as to the utility of recording employer-employe attitudes as evidence when sound criteria exist in such abundance in the form of behavior records. We should recognize the fallibility of our interpretations of what men think they think, or rather of what men *say* they think and feel. We should check these always with their actions in the face of actual conditions. The behavior of men is an objective thing, capable of accurate record, and frequently of statistical analysis; an attitude is largely subjective.

It is possible to obtain mutual acceptance of behavior facts by observers and interested parties who may have quite different views as to causes and results. Mutual acceptance of statements about attitudes is decidedly more difficult.

It would be improper to conclude from these remarks that attitude is not a useful subject to consider in industrial research. Quite the contrary—the study of attitudes has an important place, even though it be as yet a secondary one, in the appraisal of any type of joint relations in industry.

In determining attitudes, however, it is helpful to look to behavior records for verification. Men as a rule talk so loosely that their own statements of their attitudes are unreliable. Attitudes are frequently explained through the process of verification from more reliable sources than the interview. In the majority of instances the leads obtained through interview may be verified by documentary evidence. Where such evdence is not in existence, agreement by interested parties as to statement of fact may usually be obtained.

Attitudes and behaviors are both causes and results. Employes cannot have attitudes alone in a several-party group relationship. Their attitudes and actions are constantly reacting with attitudes and actions of their associates in the company having varying degrees of management functions. There is a constant play of one upon the other. Attitudes of employes are no more adequate when taken alone as evidence in a study of joint relations than is a single wage rate a sufficient test of employes' earnings.

A great deal has been made of the fact of discontent. Much of our discontent may possibly be attributed to our acquisitive and competitive society with its conflict philosophy. If this be true, such discontent is not valid evidence of success or failure of an industrial relations plan or of any mechanism or program aimed at the development of coöperative relationships. It is quite possible that the commitment of the Russell Sage investigators to the conflict philosophy, namely "It is foolish to deny the divergence of interest of employer and employe," has made difficult their appreciation of basic conditions in the practice of coöperation.

Briefly, I venture the suggestion that too much reliance be not placed upon attitudes *as evidence* and that we look more to methods which register the behavior of men. In the study of attitudes we must rely on art; in the study of behavior we may rely on the scientific method. Insofar as we do not have adequate behavior records we must turn to attitudes for our evidence. To that extent we are unscientific.

THE INTERVIEW METHOD

It is easy to agree that improvement of methods of interview is greatly needed whether or not that is to be "the next and most important advance in the technique of social research." In the present state of affairs, little confidence is justified in the interview method when applied to studies in human relations of the kind now under discussion.

The interview method would seem to place too great a burden on the investigator. He must select both the person to be interrogated and the statements which he wishes to record. He must evaluate the truth in statements made to him, noting the extent to which his questions are understood. The impression gained by the investigator is then the important thing. It is essentially subjective and unscientific. In Colorado in 1920 and 1921 the investigator had also to bear in mind the post-war psychology and the depressing influence of the industrial recession in the latter year.

It is my feeling that at its best the interview is an aid to the discovery or verification of facts through documentary and other sources. Objective data as referred to above in the discussion of attitudes and behaviors are capable of scientific treatment. The interview for the most part yields subjective information. Resort to the interview as a primary source should be made only when documentary data are missing. The interview is always a source for verification and general background.

QUESTIONS AT ISSUE

The "Questions at Issue Concerning Studies of Human Relations in Industry" outlined in the paper under discussion are extremely important in the consideration of scientific methods of research. It might be asked, however, if there are not other questions which hold equal or prior claim as issues for discussion in the present situation. The questions already raised direct attention not only to the establishment of standards for testing research methods in general, but also to the application of those standards to the Colorado research project chosen in this conference for purpose of illustration.

The following questions might also be regarded as at issue in studies of human relations in industry, particularly in their bearing upon the reports of Colorado Fuel and Iron Company studies.

1. What effect on research procedure results from different vantage points of investigators? Need there be any difference in method between a study aimed at the development of historical records and a study for the improvement of immediate situations?

2. When if ever, is it safe to rely upon a cross-section picture of an in-

dustrial situation? Are trends more important?

3. Which is of more vital concern? The discovery of an absolute level or status of a situation, or its relative position with respect to associated situations?

4. Is it possible to isolate a specific item in an industrial relation program without considering at the same time the policies and program as a whole?

5. What personnel records are pertinent to the subjects involved? How shall they be obtained in the absence of existing company computations and adequate regular reports?

6. To what extent, if any, are behavior experiences better measures for industrial relationships than attitudes?

7. What are the relative limitations of the statistical method and the interview method in scientific research?

8. In the presentation of material is there any advantage in separating facts from opinions? Also in setting up standards independent of both facts and opinions?

9. Is independence of thought as to conclusions on the part of the investigator desirable? If so, is it proper to submit preliminary drafts of conclusions to interested parties before the final draft is issued?

10. What are the relative merits of the direct question method as opposed to indirection in the interviewing process?

SUMMARY

Reviewing these too brief comments, concerning the value of which I am in grave doubt, I beg to repeat: my general endorsement of the paper in its treatment of the scientific method; the point that the published report is not convincing as to the application in the Colorado study of the pronounced principles, due in part to its form and popular appeal; that the vantage points of investigators are of vital importance in research procedure; that the value of attitudes as evidence in human relations studies is probably less than that of behavior records; that the interview method is generally unreliable; and finally, that there are several primary issues which ought to be considered along with those set forth in the leading paper.

Psychological Experience with the Interview

By R. S. Woodworth, *National Research Council*

IT HAS been suggested that the psychologist should be able to assist in the working out of sound procedure in social research. His experience with simplified forms of the interview, or "verbal report," should enable him to point out pitfalls and to furnish an estimate of the value of data obtained by similar devices. It would be immensely gratifying to the psychologist if he were able thus to contribute to the advancement of a sister science, although, as a general proposition, it appears that each science needs to fashion its own peculiar tools in conformity with the particular sorts of data which it desires to utilize.

INDIVIDUAL DIFFERENCES IN OBSERVATION

If the psychologist is to make any distinctive contribution, it will probably arise from his experience as an experimentalist. We are at once reminded of one of the oldest of psychological experiments, that on the "personal equation," an example of very numerous experiments carried on to determine the accuracy of observation and report.

Work on the personal equation was started by the astronomers, before such a thing as a psychological laboratory was in existence. In attempting to record the exact instant when a star crossed the hair line in the telescope field, even expert astronomers found that they would differ one from another by a fraction of a second, one astronomer tending rather regularly to assign a time slightly earlier than the other. An equation could be worked out, giving the correction which needed to be made in the one observer's data to make them comparable with the data of another observer. But there was no way of determining which observer was right, or whether, more probably, both were in error to some degree.

A laboratory experiment was made out of this problem by substituting for the star some object whose motion could be controlled, so that the objective fact could be known apart from the observers to be tested. The error of each separate observer could now be determined, in amount and direction. Many experiments of a similar nature were performed, and it was found that there were always errors of observation, and that these were partly *variable error* or scatter of observations, and partly *constant error*, peculiar to the individual, to the type of fact observed, and to conditions which operated to create a certain bias, twist, or trend in the observa-

tions. The existence of a variable error is easily detected, in the mere fact of scatter of observations. A group of observers will vary one from another, in reporting the same objective fact; and the same observer will vary from himself in repeated observations in the same fact. The constant error, on the contrary, cannot be determined without independent knowledge of the objective fact which the observers were trying to grasp. A barn door, against which some one has been shooting, may plainly reveal the scatter of the shots, but the constant error of the marksman can not be known unless we can locate the mark at which he was aiming.

THE PSYCHOLOGY OF REPORT

The *testimony experiment* is a study of the same sort, in a more complex field of observation and report. Court testimony gives abundant evidence of scatter, but if there is no constant error, no common bias permeating the group of witnesses, a sort of average or balance of the testimony presented may be accepted as furnishing an approximation to the true fact. Whether or not there is a constant error can only be discovered by an experiment which, as before, would consist essentially in so controlling conditions as to have independent knowledge of the objective fact.

Witnesses in court may be required to testify as to the length of time elapsing between two events, say a cry of terror and the sound of a pistol. One observer reports fifteen seconds, one half a minute, one a minute. We take a rough average of these estimates, and conclude that the time must have been something like half a minute. But is there a constant error in this sort of estimation? An experiment may tell. Take out your watch before an audience, and say, "I want you each to estimate the time between the moment when I say 'Begin' and the moment when I say 'Stop.'" Allow 15 seconds to elapse, and you will find that the estimates range from perhaps 15 seconds as a lower limit to a minute or a minute and a half, with an average of about 25 to 30 seconds. There is then a large constant error, in the direction of overestimation of time, under certain conditions. Change the conditions, and you alter the amount of the constant error, and may even reverse its direction.

A more interesting experiment on the same general sort consists in enacting a little scene before an audience, allowing them to believe that it simply happened, and later to have each member of the group report the event and answer questions upon it. The scene must be carefully rehearsed in advance, so that there may be independent knowledge of the objective facts. Among many such testimony experiments that have been made, I will describe one in which I myself took part, because it brings out the fact of constant error, the most important fact in this whole subject.

I conspired with two students, out of a college class of about thirty young men, to enact this little scene before the class. I interrupted my lecture at a predetermined time to say that Mr. A (one of my fellow-conspirators) had prepared a memory experiment for the class to try. Mr. A then came

to the desk, and between us we placed a low screen upon the desk, and placed behind the screen several objects from underneath the desk. Mr. A then said, "We shall need to light the desk light," which stood behind our screen. I turned the key on the socket, but no light came. Mr. A. went to the wall switch, but still no light. Both of us stood registering perplexity, when Mr. B., the other conspirator, who was sitting in the front row, started up, extended his arm over the screen, and screwed in the bulb, producing light. As Mr. B. took his seat again, I from behind gave the screen a push and it fell on the floor, revealing the objects behind it. Mr. A and I registered annoyance, I remarked that we couldn't continue with the experiment now, hastily removed the objects from the desk top, and resumed my lecture.

Two days later, a free report of this scene was written by each of the witnesses, and a number of specific questions were also answered. I will mention only one fact that came out. The members of the class were practically unanimous in reporting that Mr. B, "butting into the experiment," had spoiled it by knocking down the screen. Some witnesses told exactly how Mr. B had done it. He was a senior, and the seniors were wearing gowns, more or less, at this time. One witness explained that Mr. B's senior gown became entangled with the screen and pulled it down. As a matter of fact, Mr. B was not wearing his gown that day.

Now here we have a constant error in a mass of harmonious testimony, and we can see, roughly, the source of the constant error. Mr. B certainly seemed to be an outsider, "butting in" though with good intentions. That conception of his action was almost forced upon the witnesses from the instant he rose from his seat. What followed was seen in the light of this preconception. The conception which the witness brings with him to the scene, or which is aroused in him by the early stages of an occurrence, has much to do with his interpretation of what is enacted before him.

SOURCES OF ERROR

The phraseology just used, "preconception controlling interpretation" of facts, is too intellectual to cover the ground properly. Often there is no preconception in any definite sense, but there is an attitude or "mental set" on the part of the witness, which controls his perception and report of facts in no small degree. The psychologist has had abundant experience of testimony distorted by mental set. The introspectionist, who depends for his data almost wholly on the testimony or verbal report of his subjects, finds that the same kind of subjects, as graduate students in psychology, reporting on the same type of mental process, as the solution of an arithmetical problem, will notice different phenomena in one laboratory than in another, according to the prevailing bias of the particular school.

The psychoanalyst is another type of psychologist who depends greatly upon testimony from his subjects, and he would insist as strongly as possible that the subject's report cannot be accepted at its face value. It is subject to "rationalization," it is

not free and untrammelled, but distorted by the subject's attitude of self-concern. Fearful self-concern, self-protective in tendency, is oftenest encountered in securing reports on any matter of personal interest to the subject; but a more aggressive or self-advancing attitude is also to be reckoned with. Except regarding matters that are extremely definite, objective and impersonal, it seems almost hopeless to secure from the average person any testimony that is not colored by self-concern. I should mention, however, the rather remarkable result obtained by Healy in the study of juvenile delinquents. In many cases, he has found it possible to win the confidence of the juvenile subject, and to make him feel that it is for his good to unearth the facts of the case, what there is that is troubling him, and how he first got into the way of stealing, for example. The subject's self-concern is here given a new and unusual slant; it is turned towards unearthing the true facts, instead of towards distortion of the facts for protective or aggressive purposes. A similar utilization of the usually distorting attitude of self-concern may sometimes be possible in obtaining testimony on social problems.

TRAINING IN FACT-FINDING

The anthropologist, in his study of language, myth and custom, is dependent on interviews, and has much information to impart on the technique and pitfalls of interviewing. I believe it was the anthropologist who first discovered rationalization of testimony, a very dangerous pitfall for the investigator. The unwary beginner in anthropological investigation is also apt to stumble into another pitfall. His informant will seek to divine what answers will please the investigator, and answer accordingly. In the past, many false accounts of primitive peoples have arisen in this way. The informant is here activated by a form of self-concern; he seeks to get through the interview as comfortably as possible. Employment managers have reported much the same thing. It would seem that one could gain some knowledge regarding the causes of labor turn-over from asking each man leaving an organization why he was leaving; but the employment manager finds that the man, under ordinary conditions, simply gives an answer that will make no fuss; he will very seldom report any dissatisfaction with the job he is leaving.

In a broad sense, the social investigator is doing an anthropological job. He is investigating some phase of culture. Usually he is studying the culture of his own group, and feels some concern himself as to how the facts are going to turn out. The bias of the investigator is very apt to generate a bias in the informant, and so to color the data obtained. The anthropologist, in his typical job, has the advantage of studying an alien culture, with which he has no personal concern. It is comparatively easy for him to take an objective, fact-finding attitude, without fear or favor. It would seem that experience in typical anthropological investigation would be a valuable asset to the social investigator.

Quantitative Analysis: Some Applications to Personnel Problems

By William A. Berridge, *Metropolitan Life Insurance Company, and Brown University*

THE purpose of this paper is not to censure the *modus operandi* commonly employed either in industrial relations researches generally or in any particular study within that field. It is rather to point out a certain avenue of approach which has not, perhaps, been sufficiently emphasized by students attacking such problems, and to show not only that quantitative analysis is *desirable*, but that also—to an extent not widely realized—it is rapidly becoming *feasible*. Trails are being opened up which, through concerted action by those interested or participating in personnel research, will be widened for all to follow at no distant day.

Before proceeding further, it should be understood that the *substitution* of quantitative or statistical analysis for the processes of qualitative observation, reasoned judgment and action in personnel problems, is not advocated. It is through no mere accident that personnel managers, and the more cloistered students whose contact with actual problems is less frequent and direct, have used qualitative more than quantitative analysis. Such a distribution of emphasis is natural in the earlier stages of any science or art. It is especially natural in industrial relations, where so much depends upon warm sympathy and keen understanding of human nature. There is not—indeed, could not be—any substitute for these human approaches.

On the other hand, personnel managers should be urged to support more strongly, and actively to participate in, quantitative measurement of their problems, just as their brethren in the production, sales, and other functional departments of business concerns have been doing in greater and greater numbers during the last decade. Judgment would then be more accurate and action more effective. Not only in large but also in many so-called medium-sized firms, many opportunities lie in wait. The objectivity and the accuracy available through quantitative methods can provide, as it were, a "shield and buckler" for fortifying judgment and action against error, or the charge of error. At least some of the quantitative analyses suggested in this paper would help in evaluating the success of particular devices adopted by the personnel management after they had been working a while.

What statistical applications, then, seem especially appropriate to the case at hand? The proposed measurements may be roughly classed into two

non-water-tight groups: the variables reflecting (*a*) economic and (*b*) psychological conditions within the work force.[1]

BAROMETERS OF ECONOMIC CONDITION

A most important economic variable is the number at work, or on the payroll, each week or each month. To be of utmost value this record, like nearly all of those advocated in the present paper, should be extended backward at similar intervals over a period of several years, if the company's data permit, and presented in a clear, simple graph, to be kept up to date for the observation of the general and personnel executives. If practicable, separate curves should be prepared, on a similar time-scale, for (*a*) each important department, and (*b*) each important occupational group, within the establishment.

In some organizations it is also possible to plot on a similar basis the curves for employee-hours, which unlike the employment curve register over-time and part-time work. This measurement is generally feasible in those departments or occupations where time rates are paid. Also, in those companies which pay all or a part of their operatives piece rates, it is becoming more feasible because of the growing use of time-punch records even in such cases.

Closely related to employment and employee-hours is the income of the force from its work in the establishment. Such evidence, readily available in the weekly or monthly payrolls, may even excel employment as a barometer of economic conditions among the work force; this is particularly true if adequate data are available on the course of living costs, making possible the calculation of "real" incomes.

Preferably, though not necessarily, these economic registers of the volume of employment and incomes among the work force should be supported by figures on either the average amount earned per worker or the standard rates of wages. To be most valuable, both types of evidence should, when practicable, be classified by sex and occupation, and the former at least by department also. The latter type cannot be cast into index-number form without great difficulty. In many plants the only practical expedient is to plot and observe the course of standard rates for a few standard or "key" occupations. In others, where the numbers of employees and of key occupations are fairly large, experiments with wage-rate indexes should certainly be undertaken.

Some day we shall have in this country a current monthly index of wage-rates, analogous to the two indexes already available in Great Britain through the work of Bowley and Hilton. It is anomalous that a country which provides itself so many economic barometers as does the United States should have at its disposal none showing currently the general course of wage-rates. These have such a profound bearing upon production costs as well as the condition of wage-earners

[1] To limit the issue and make possible a more intensive treatment, the writer is obliged to omit certain other applications of quantitative analysis to personnel problems—for instance, the extremely important subject of industrial accident statistics within the plant.

and the consuming public generally, that the scattered evidence is bound to be gathered and cast into currently usable index-number form before many years. Personnel managers in fairly large industrial and other establishments, where a considerable number and variety of types of labor are used, are in a position to bring this *desideratum* somewhat nearer by gathering their plant records and undertaking a purely internal analysis along this line.

Charts showing volume of employment and earnings by months or weeks over an extended period (preferably five years or longer) are most useful for management purposes when they can be compared with corresponding curves derived from other establishments in the same or a related line of activity. For factories, such comparisons of internal with external conditions may be made in several states. New York, Massachusetts, Illinois and Wisconsin are among those having such series available over varying periods. The United States Bureau of Labor Statistics has been engaged in a similar enterprise, although its data (like those of the States, except New York and Wisconsin) are not all available over a long period in a homogeneous and thoroughly dependable form.[2] These materials have been shown to have much value as registers of general economic conditions, but in my judgment they have been too little used in the very important problems of personnel management within an individual concern, through such intercomparisons as those above outlined.

Even when no comparison with external conditions is undertaken, a management can through analysis of its internal statistics on employment and earnings throw useful light on the changing extent, violence, and timing of seasonal ups and downs. This helps the personnel man in formulating his hiring or firing policy. Further than that, the employment or employee-hours curve will afford to other members of the executive staff the closest available approximation to the course of production, in those lines where no direct count of production units is feasible. Moreover, they show in a convincing form how important it may be for the management to undertake experiments with a view to reducing either seasonal or cyclical irregularity in its operations. Many firms, brought to realize the cost element involved in such instability, are now taking steps to that end—through introduction of dovetailed products, inter-departmental transfers of personnel, properly timed price-discount or advertising policies,[3] and the like. The curves above mentioned serve as a useful measuring stick of not only the need of such devices but of the success attained after their installation.

[2] Compare the work done by the Federal Reserve in compounding the best of these data into index numbers, by industry, extending back in dependable form to January 1919. (*Federal Reserve Bulletin*, December, 1923, pp. 1272–1279, and May, 1925, pp. 324–327.)

[3] For a good recent book on this subject see Prof. H. Feldman's "Regularization of Employment," New York: Harper and Brothers, 1925.

Also see the pamphlets being prepared by the Metropolitan Life Insurance Company.

A just challenge to the use of earnings alone as a barometer of well-being is that it makes no allowance for changes in living costs. It measures only the volume of pecuniary earnings, not real or commodity income. It would be desirable, but in most localities is not at present feasible, to watch the course of local living costs. The United States Bureau of Labor Statistics and two or three other organizations collect cost of living figures at periodical intervals. These are useful in a general way, but not always dependable as regards a particular locality. Although fairly specific data are available as to foods, the course of rentals, clothing costs, fuel costs and the like cannot yet be followed in a very satisfactory way, except in the relatively few cities for which actual local data are provided by an authoritative organization. The Commission on the Necessaries of Life renders valuable service to several Massachusetts cities and towns by supplying such data monthly.

Perhaps the cost of living is one of the problems upon which light can best be thrown by a purely local, rather than a state or national, research organization. If not some agency of the local government then perhaps a local bureau of business research might undertake to collect, analyze and report upon living costs. Already at least four universities—Denver, Illinois, Pittsburgh, and Brown—have bureaus which seek to measure local economic conditions; although it is doubtful whether any of these has yet attempted a canvass of living costs. In time, personnel managers will be able to resort to such local research agencies for many more data and facts than heretofore. They can help themselves by agitating the need for local economic analysis in properly equipped colleges or universities located in their respective cities. They can also press the United States Department of Labor not to curtail the scope of the cost of living data now being reported; without such pressure the curtailment in this direction is likely, owing to recent cuts in appropriation.

BAROMETERS OF PSYCHOLOGICAL CONDITION

Since no new "psychometer" for *directly* measuring the state of mind of a work force has been invented, more widespread tabulation of labor turnover, using a standard slate of definitions, in factories and other establishments is strongly recommended as a probable *reflex* of psychological condition. It is also urged that these data be pooled with some responsible organization, and worked into a composite barometer of the turnover experience within the reporting firms.

A recent development in the field of labor turnover analysis may be of interest to readers of this JOURNAL.

A new monthly index of the mobility or "turnover" of industrial labor, covering more than six years, is presented in the accompanying chart. It is based upon data reported to the Brown University Bureau of Business Research by the industrial relations managers of selected plants in Rhode Island. This represents apparently the first attempt made in this country to publish a current index of labor turnover with a view to keeping personnel managers informed at frequent inter-

vals on the changing importance of the problem.

The conception of the labor turnover problem, and of the statistical coefficients best suited to its measurement, of course differ considerably among the various writers on the subject.[4] Compare, for instance, P. F. Brissenden and E. Frankel, "Labor Turnover in Industry," Macmillan, 1922; also J. H. Willits, A. Bezanson, and others, "A Study in Labor Mobility" (Annals of the American Academy of Political and Social Science. Supplement, September 1922); and the masterly study issued by the same group under the title "Four Years of Labor Mobility" (Annals of the American Academy of Political and Social Science. Supplement, May, 1925).

The charted index is simply the average, for the reporting concerns, of the number of voluntary departures divided by the total number of employees actually on the payroll during the current month. Although the distinction between voluntary resignations, or quits, and other departures from payroll—layoffs, discharges, etc. —is not perfectly definite, and indeed differs from one firm to another, we find that each firm represented in the index has itself followed a fairly consistent practice in definition throughout the period covered. Anaylsis of the individual firms' records shows that the voluntary departures index represents pretty adequately changes in the mobility or "slipperiness" of industrial labor in Rhode Island.

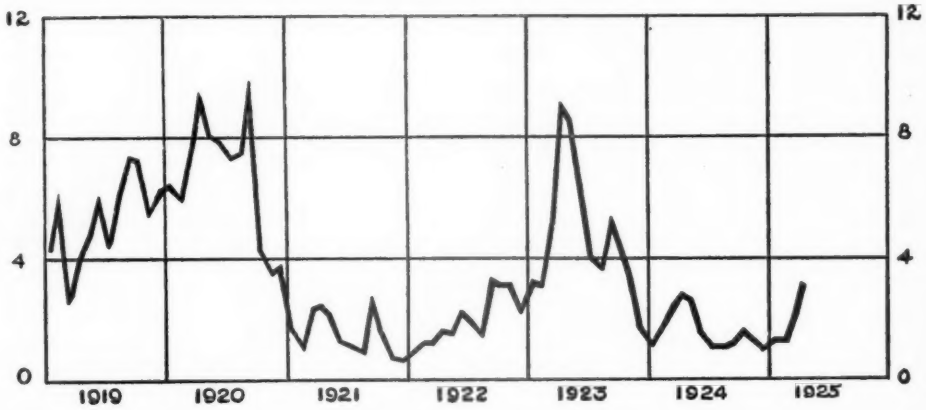


FIG. 1. A CURRENT MEASURE OF LABOR TURNOVER: RATIO OF VOLUNTARY DEPARTURES TO NUMBER ON PAYROLL IN SELECTED RHODE ISLAND ESTABLISHMENTS
(Unit: 1 per cent, monthly basis)

As figure 1 shows, a fairly low ratio of voluntary departures to number on payroll prevailed during the few months after the Armistice, but was followed by a rapid rise which culminated in 1920, especially the extreme peaks of April and September. Dur-

[4] For an excellent synopsis of the statistical ratios proposed by various writers, see W. D. Scott and R. C. Clothier, "Personnel Management." Chicago: A. W. Shaw Co., 1923, pp. 539–563.

ing an industrial boom employers find much greater difficulty in holding their labor force against the centrifugal force of higher wages, better working conditions, etc., which workmen can find in other establishments.

But in the liquidation of late 1920 and early 1921 the ratio fell rapidly to a figure as low as *one-tenth of that in 1920;* and it remained low until the beginning of 1922. When industry is dull, workmen strongly prefer, where they can, to stick to their jobs, believing that "a bird in the hand is worth two in the bush."

During 1922 the ratio increased with slight interruptions, and during the first five months of 1923 it rose much more rapidly, finally reaching, in May, a figure *over nine times as great as that prevailing in late 1921.* Then it fell for about twenty months, except for temporary recoveries in the autumn of 1923 and in the second quarter of 1924. In the first quarter of 1925 it rose again, in response to moderate industrial activity, though not to nearly so great an extent as in 1920 or 1923; and in May it declined owing chiefly to a setback in industrial activity and its natural influence on employee psychology.

The index of voluntary departures is useful in two ways: (1) it shows quantitatively the extent to which business cycles and the round of the seasons[5] influence labor mobility—facts otherwise known only in a crude and general way; (2) it provides a standard of comparison, by the aid of which individual employers or personnel officers in Rhode Island may compare their own similarly prepared turnover record with the more general experience. The extremely violent fluctuations above shown to exist in the State render it impossible for an individual personnel manager to determine how much of any particular rise or fall in his own curve is due to internal causes of dissatisfaction—poor foremanship, unsatisfactory selection, low morale, and the like—and how much to external factors generated by business activity, keen competitive bidding for labor, etc. The composite curve, however, provides him a current norm of experience, by comparison with which he can more readily isolate these factors, thereby singling out more definitely his managerial problems from the more general economic problems over which he has no control.

One of the best single barometers for measuring the effectiveness of the work done by a personnel department in maintaining morale as well as in other directions is the relationship between the course of the voluntary departure rate in that establishment and in a group of establishments engaged in related lines of business. This at least is the view of the Rhode Island Industrial Relations Association, the members of which have recently agreed to pool with the Brown Bureau more comprehensive data for furthering the coöperative analysis of turnover in its other aspects.

Of course, it is only within localities where competition prevails in the labor market, that such a comparison of plant records with more general

[5] These two types of variation have not yet been isolated from each other, but soon will be. It is hoped that corresponding indexes *by industry* will ultimately be made available.

records means anything. But where it is significant it means a great deal as a measure of the psychological reaction on the part of the labor force to the "imponderable" features of its employer's personnel management. It should be much more useful than mere study of absenteeism and tardiness, sometimes regarded as barometers of morale. It is for that reason that the Metropolitan Life Insurance Company hopes to establish an arrangement for collecting turnover data from its group life policyholders and working out composite barometers for their common use in comparing individual with mass experience.

To stimulate the measurement of labor turnover and other variables as advocated in this paper—and not only their measurement within the concern, but comparison with corresponding external evidence—is a highly commendable project for any group of progressive personnel experts interested in recording with greater precision the economic and psychological pulse of labor.

Research in the Selection of Motormen

Part II. Methods Devised for the Milwaukee Electric Railway and Light Company

By Morris S. Viteles, *University of Pennsylvania*

The prime requisites of a street car motorman were studied on the job as well as in the laboratory by Dr. Viteles. In testing for the desired qualities, he found—in the preliminary investigation here reported—little correspondence between ratings of supervisors and scores on general intelligence tests or on standard personality tests. More promising results were obtained with a test devised to measure specific abilities needed in operating a car so as to avoid accidents and with an especially designed Judgment Test.

THE preliminary investigation described in this article was started in the summer of 1920. At that time the author had at his disposal only the description of Münsterberg's experiment and an account of the work done by Gerhardt with the Münsterberg and other tests. Descriptions of the work of foreign investigators were not then available. It appears now that the apparatus devised by the author and described in the present article is similar, in some respects, to that used by German investigators. This similarity is altogether a fortuituous one. It is the result of an accord on the part of independent investigators on the analysis of the abilities underlying the safe operation of a street car. The points of similarity will not be discussed here, inasmuch as a discussion of the general principles underlying the work of the German psychologists and a detailed description of the tests used by them have already been published in the July number of this Journal.

Perhaps the most obvious step to have taken in starting the present investigation would have been to follow along the lines which Münsterberg started; to investigate further the possibility of using his apparatus in the selection of competent motormen. This was not done for a number of reasons. First the company under whose auspices the present study is being made had tried out the Münsterberg test, without success, shortly after Münsterberg announced its discovery. The sentiment among the officers of the company was decidedly against further experimental work with this test. Secondly, and more important, the investigator's analysis of the problem

was decidedly unlike that made by Münsterberg and pointed definitely to the need for a different approach, involving both different apparatus and different technique in selection. The analysis in this case was based not only upon consultation with motormen, supervisors, instructors, and superintendents, but upon observation made in the course of a two-weeks' apprenticeship as a motorman, during which time the investigator ran street cars in every section of the city under a great variety of conditions.

Münsterberg set out to devise a test for the selection of those men who would be least likely to have accidents in the operation of a street car. He decided, as it has been pointed out, that the process which seems to be the "central one for the problem of accidents" was a "particular complicated act of attention by which the manifoldness of objects, the pedestrians, the carriages, and the automobiles, are continuously observed with reference to their rapidity and direction in the quickly changing panorama of the street. . . . . In the face of such manifoldness, there are men whose impulses are almost inhibited and who instinctively desire to wait for the movement of the nearest objects; they would evidently be unfit for the service, as they would drive the electric car far too slowly. There are others who, even with a car at high speed, can adjust themselves for a time to the complex moving situation, but whose attention soon lapses, and while they are fixating a rather distant carriage, may overlook a pedestrian who carelessly crosses the track immediately in front of their car. In short, we have a great variety of mental types of this characteristic unified acitivity, which may be understood as a particular combination of attention and imagination."[1]

In the avoidance of accidents "the *ability to keep attention constant*, to resist distraction by chance happenings on the street, and *especially the always needed ability to foresee the possible movements of pedestrians and and vehicles*"[2] were found by Münsterberg to be of greatest importance. His test is designed to test the abilities to *keep attention constant* and *to foresee* the possible movements of each unit of attention. Whether or not it succeeds in testing even these will not be discussed here.

To the author Münsterberg's analysis of the problem seemed altogether inadequate. The selection of safe motormen involves not only the measurement of attention factors, but also the measurement of selective muscular response. Keeping attention constant and foreseeing danger do not include all of the abilities involved in avoiding accidents. Another, and equally important factor is to react in such a manner as to avoid the accident. Consciousness is a factor, but behavior wins or loses the day. The behavior is of a particular type, a selected, coördinated response which will be described in greater detail below. The capacity of the individual to exhibit such responses must be measured by any test purporting to be

[1] Hugo Münsterberg. *Psychology and Industrial Efficiency*. Boston: Houghton Mifflin, 1913, p. 66.

[2] The italics are not found in Münsterberg's text.

of service in the selection of safe motormen.

In addition to avoiding accidents, motormen have other duties to perform. The successful performance of these duties, important in street car operation, depend upon factors other than those discussed above. It seemed that these other aspects of competency might lend themselves to testing procedure as readily as the ability to avoid accidents. Their measurement was made part of the problem of the present investigation, although the testing of safety in street car operation was set up as its most important objective.

The detailed analysis of the job of motorman which has determined the character of the present investigation and the nature of the apparatus evolved in the course of it, is presented below.

DUTIES AND ABILITIES OF MOTORMEN

Competency as a motorman involves success in at least five different types of activities.

1. The first are activities involved in *avoiding accidents under usual running conditions.*

There are, first of all, those described by Münsterberg. The motorman must *pay constant attention* to the changing panorama before him, to moving automobiles, children playing in the street, traffic policemen, switches, circuit breakers, and to many other objects in the field of vision. There are involved in this such mental abilities as persistence of attention, alertness and memory span, the ability to grasp in one moment of attention a number of distinct and variable stimuli. A restricted range of vision constitutes a decided disadvantage in the performance of this operation.

The motorman must also *foresee* possible movements on the part of traffic and pedestrians and be prepared to meet these changing conditions. In foreseeing and preparing for movements of traffic an element of *apperception* is involved. The motorman applies his past experience in the present situation to foretell movements of traffic. He *learns* to be a prophet; it is only through experience that he becomes endowed with a knowledge necessary to foresee that one of a row of automobiles standing alongside a track may suddenly start and swerve into the tracks, and that it is therefore desirable to slow up when approaching such a row of automobiles. The new motorman is at a decided disadvantage in meeting this usual running condition in comparison with a more experienced motorman, not because he has less of the innate ability necessary to meet his condition, but because he has less knowledge of possible developments in the street. *Judgment* is involved to some extent, but even this functions in most cases only in combination with a memory of former experiences. The pronounced decrease in the number of accidents in the case of more experienced as against less experienced motormen is doubtless due largely to the fact that the more experienced men recognize more readily than the new men the potential danger spot in the street. The capacity of the individual to profit from experience and to apply this knowledge in foreseeing and preparing for danger must therefore be subjected to meas-

urement in the selection of competent motormen.

It has been noted that paying constant attention and foreseeing danger do not include all of the factors of importance in avoiding accidents under usual running conditions. Another and more important factor is to *react* in such a manner as to avoid the accident. The motorman can stop the car, he can speed it up; he need, in certain cases, do neither; he may only sound his bell or signal the conductor. The response best suited to the situation is, in most cases, determined by the memory of former and similar situations. *It is a learned response associated through experience with a given situation stimulus.* The degree to which a given new motorman avoids accidents even under the usual running conditions will then, in the main, be determined by his capacity to learn to associate a given response with a given situation and to give the appropriate response when faced with a similar situation. Sounding the bell at street corners; stopping at the traffic signal set against him, operating electric switches, decreasing speed when running by parked automobiles, are examples of such learned responses. The response which he gives is generally a complex one, involving the coördination of a number of muscles of arms and legs and of both sides of the body.

Other factors are also of importance in avoiding accidents under usual running conditions. Among these are the perception of distance and the estimation of the speed of the car which the motorman is driving as well as of moving objects observed by him. At least one of these, the estimation of speed of the moving car, is affected by experience. All should be subjected to measurement in adequate selection.

2. The second group of activities in street car operation are those designed to *meet the emergency.*

The most serious and the most costly accidents in street railway operation grow out of the unexpected. The motorman's attention is diverted from the street for a moment. When he looks back a child who was not in the field of vision before attention was distracted, is crossing the path of the trolley. An automobile which has been proceeding in front of the trolley unexpectedly breaks down. As the motorman begins to brake the car at a street corner, the air brake fails to work properly. All of these are unexpected dangers requiring an immediate response best suited to avoid the accident. In the great majority of cases there is neither time nor occasion for a conscious choice—for the exercise of judgment. The response called for is a motor act which has been associated with a stimulus during a learning process and perhaps by experience subsequent to it. There is no conscious choice, no exercise of judgment in the rush for the hand brake in the case of the broken air brake, and in the manipulation of the latter in the case of the child crossing the path of the trolley. Through practice the *hand brake reaction* has been associated with the *broken air brake stimulus*, and through similar practice the *air brake response* has been associated with a *child crossing the track stimulus.* In other words, when the emergency does arise, the avoid-

ance of the accident will depend upon the consistency with which an appropriate learned response follows a certain stimulus, although the stimulus may be one of a whole group presented at the same time, the others of which ordinarily elicit no response. In the emergency, as in the case of operation under usual running conditions, it is by the exhibition of the appropriate learned response that a potential accident is avoided.[3]

In considering emergencies, it must be recognized that a certain number of these and of the resulting accidents, are created by the failure of the motorman to attend to the street before him. That there are differences in the capacity to attend has been indicated in the preceding section. Any test which hopes to differentiate among applicants for employment as motormen must measure this capacity to attend and to observe simultaneously and consistently a group of changing stimuli, both visual and auditory.

The judgment of distance on speed is involved in meeting the emergency as well as in avoiding accidents under usual running conditions.

Summarizing the discussion under the latter part of (1) and under (2) it is seen that the *safe motorman, the one who will be least likely to cause accidents is first of all the one who can pay consistent attention and will observe all that goes on in the street. He not only pays attention but he gives the proper selective coördinated response to the stimulus which he perceives.* When the child suddenly darts out in front of the car he quickly shuts off the power and puts on the brakes; under other conditions he rapidly feeds power and releases the brakes, etc. The difference between the man who "gets rattled" and the man who "keeps cool" in an emergency is that in the case of the former, response is entirely inhibited or an incorrect response is exhibited, whereas the latter responds under all conditions with a correct reaction.

In considering the creation of emergency the matter of *temperamental differences* must be considered. An individual who is capable of avoiding accidents may be careless, even reckless. A man who has all the qualities of attention, foresight and control may find pleasure in being reckless and thereby run into accidents. Recklessness on the part of even a competent motorman is doubtless responsible for a certain proportion of accidents, and must be considered in selection, but

[3] Learners and experienced men are on equal terms in so far as the unexpectedness of the stimulus is concerned. The fact that the average number of accidents decreases with length of service may suggest that the experienced motorman has the advantage in so far as certainty of response is concerned. There are, however, complications in analyzing the causes here. The most incompetent motormen either voluntarily leave the service or are discharged early in their careers as motormen, usually following a serious accident or an unusually great number of minor accidents. Moreover, there is a great difference in the average number of accidents among men in the service for the same length of time, showing that experience on the part of the motormen is not the only or necessarily the most important factor in safety.

Another factor to be considered is that the new men, working as extras during the rush period when traffic is congested, with differing types of equipment, really have the more difficult runs.

the central problem in the prevention of accidents ascribable to the human element in street car operation, is that of eliminating in the course of employment the *incompetent* candidates for the position of motormen; those who, by reason of innate defect in specific mental ability, cannot be expected to become safe motormen.

3. A third group of activities have to do with the *operation of the car under usual running conditions.* Maintaining schedules, saving current, the proper operation of switches, the coördination of activities in stopping and starting the car without a jerk, in opening and shutting doors, and in making minor repairs, should be considered here. The efficiency with which these activities are performed is in a large part dependent upon training, and thereby indirectly upon the capacity of the individual to profit from instruction in these operations. It may involve what has been called "general intelligence" and specific mental abilities such as memory, mechanical aptitude, etc., the importance of which in street car operation should be submitted to experimental investigation. In some of these, such as in maintaining schedules and in the readiness to obey instructions governing car operation, personality traits of the type listed under "temperament" or "character" are doubtless involved.

4. The fourth group of activities are those designed *to maintain pleasant relations with the public.* A motorman must not only avoid accident, maintain schedules and save current; he must be courteous to the public and considerate of their interests. These activities depend upon temperamental qualities which are as of great importance in total success on the job as the others discussed above. The maintenance of pleasant relations with the public involves, moreover, the capacity to supply the public with such information about streets, car routes, etc., as it can reasonably expect from the employee of a public service corporation. Other qualities involved in these activities and their measurement will be discussed below.

5. A fifth group of activities which help determine the success of a motorman are those which determine his *relationship to the employing company and to his fellow employees.* Promptness in reporting to work and regularity are perhaps more essential in a service job such as that of motorman than in a production job in a factory. Cars must be operated every day and on time, and lateness and absence play havoc with schedules. Moreover, a motorman generally works with a conductor and he must be able to coöperate with him and other employees with whom he comes into close association. Honesty in fare collections and loyalty to company traditions are other determinants of behavior.

Stability is another factor to be considered. The man who remains in the employ of the company for a relatively long period is to be preferred to the one who leaves shortly after employment. This is of particular importance in view of the influence of experience upon accidents. It is difficult to determine exactly the value of experience, but that it is an important influence in decreasing the

number and seriousness of accidents is beyond doubt.

The steps which have been taken in the measurement of the psychological factors underlying these five groups of activities will be discussed below.

SELECTION APPARATUS

As indicated above, the central problem in the present investigation was that of devising tests for the selection of potentially safe motormen; in other words, for the selection of those who possess qualities which are of service in avoiding accidents.

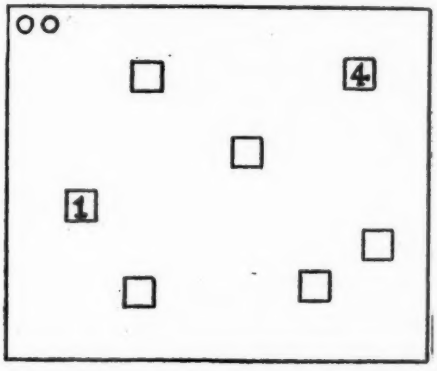


FIG. 1. SIGNAL BOARD FOR VISUAL STIMULI

A test known as the *Viteles Motorman Selection Test* was devised for this purpose.[4] There are four main parts to this Motorman Selection Test:[5]

1. *Signal board for visual stimuli*, 4 × 5 feet. The board is placed on the wall at a distance of 20 feet from the examiner, in such a position that the bottom of the board is three feet six inches above the floor. On this board (see figure 1), scattered irregularly over it, are seven square openings covered with tissue paper. Behind each opening is a 15 watt lamp. On the upper left hand corner of the board, as seen by the man who is being examined, are a small red bulb and a small blue bulb. The lights behind the tissue covered apertures are wired so as to flash at regular intervals, all seven lights flashing at one time. Each of the lights marked 1 and 4 can be cut out by the examiner, so that only the remaining apertures flash on. The failure of aperture 1 to

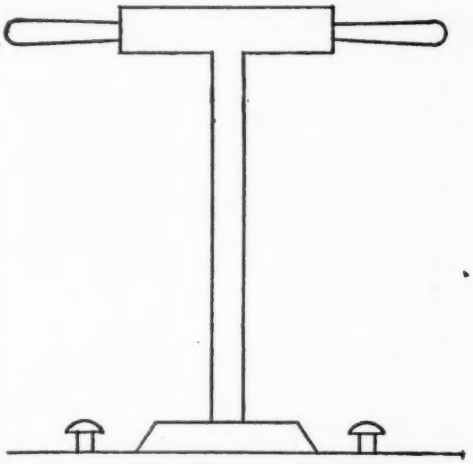


FIG. 2. REACTION STAND

[4] Acknowledgment is due and is hereby gratefully made to Dr. Arthur J. Rowland, Educational Director of the Milwaukee Electric Railway and Light Company for his helpful coöperation in devising this test, and for his contribution in planning its mechanical construction.

[5] There have been a few minor changes in material used in constructing the tests and additional improvements since the *preliminary investigation*, but from the point of view of function, these four fundamental parts have remained unchanged.

be illumined as the remaining six lights flash on constitutes Signal 1. The failure of aperture 4 to be illumined as the remaining six lights flash on, constitutes Signal 2. With each of these signals is associated a stated response on the reaction stand.

2. *Signal board for auditory stimuli.* This has on it a bell and a noise-making device (horn). With each of these a definite reaction is associated.

3. *Reaction stand* upon which are mounted two handles (see figure 2) which can be moved backward and forward from a central point. At the foot of the stand are two pedals, representing two foot pedals on the front end of a street car.

4. In addition, there is a *distraction signal* consisting of a 250-watt lamp mounted on a stand. This is placed about ten feet to the right of the *signal board for visual stimuli* and somewhat in front of it.

HOW THE VITELES TEST IS GIVEN

The administration of the test calls for (1) a *training period*, and (2) a *testing period.* Approximately 35 minutes are required for the complete examination—including training and testing—of the individual employee.

The training period

During the training period the examinee is taught the appropriate response to be given to each of the four signals—two visual and two auditory. For example, he is taught that when aperture No. 1 remains dark as the lights behind the remaining six apertures flash on, he is to pull both handles toward him and step on the left pedal. For each stimulus there is a similar response involving either movements of the two hands alone or combined hand and foot movements.

A definite training program has been outlined.[6] The program is standard for each individual with reference to the method of training but not with reference to the time spent in training. The amount of training given to each applicant depends upon the speed with which he attains *definite standards of learning which have been experimentally established.* Training is continued until these criteria have been satisfied. Although the length of the training periods of different individuals differ, there is a minimum training received by every examinee. During the training period the examinee can tell from the illuminated red and blue lights and of the darkened spaces on

[6] The character of the training program is determined by the analysis of the job of motorman. This analysis indicates that with reference to learning to operate a street car and safety in operation there are four types of motormen:

1. Those who learn quickly and make safe motormen.
2. Those who learn slowly and make safe motormen.
3. Those who learn quickly and do not make safe motormen.
4. Those who learn slowly and do not make safe motormen.

Candidates who fall into the first group are naturally those who should receive preference in selection. Those who fall into the second group can also be considered for selection, inasmuch as a difference of a few days or even a week in training time is relatively unimportant in the light of the characteristic of safety in street car operation. Candidates who conform to the description under 3 and 4 must naturally be eliminated by any test designed to select men competent to operate a street car safely.

the board whether he has given the correct response to the stimulus. The red light, for example, goes on only when the subject gives the correct response to the bell stimulus. By watching the lights he can observe and correct errors in response during the training period.

The testing period

Immediately following the completion of training, the testing period is started. During the testing period, in the preliminary investigation, the lights were flashed 150 times, the first hundred flashes appearing at the rate of 25 flashes and 25 rest periods per minute, the remaining 50 at the rate of 40 flashes and 40 rest periods per minute. *Within each hundred flashes, 25 signals, visual and auditory, were distributed irregularly.*[7] Failure to respond to a test signal, an incorrect response, and a response at a time when no signal is given are counted as errors.

In the preliminary investigation the subject received no instructions concerning the visual distraction signal. At irregular intervals the bright light was flashed, in some cases in combination with one of the visual or auditory signals. In all, the distraction signal was given eight times during each testing period.

Errors were counted when the subject gave one of the learned responses to the distraction signal, to which no response on the part of the subject was expected, or when he gave an incorrect response to the visual or auditory signal accompanying it. This procedure was not found to be altogether satisfactory even during the preliminary investigation, and there is still some experimental work to be done in the standardization of this distraction feature of the testing apparatus.

At the time of the preliminary investigation the apparatus was neither operated automatically nor were errors automatically recorded. At that time errors were noted by a secretary from the observation of lamps placed behind the examinee. These lamps can be seen in the picture which shows the test in its first form.

At the present time the operation of the apparatus during the training period is partly automatic; during the testing period the operation and recording of the results is altogether automatic.[8] The examiner is free to

[7] The speed and the number of signals have been changed in the course of the last few years. Changes which have been made will be reported upon later.

[8] In its present form the *Viteles Motorman Selection Test* is built into a cabinet with buttons controlling the various contacts. The automatic recording device consists of a roller and type mechanism. A paper tape moves in conjunction with the ribbon controlling. The signals and the responses are recorded by means of keys which strike against an inked ribbon placed over the paper tape. The flashes are recorded by means of the symbol 0. Number 1 represents the hand response to the lower light signal, 2 the foot response, 3 and 4 the hand and foot responses to the upper light, 5 for the horn and 6 for the bell.

The signals are given co-incidentally with the flashes, so that by measuring the distance from the symbol 0 to the record of the response, the examiner can determine how long it took the subject to respond in any given case. One can also see at a glance whether the movements are well co-ordinated or whether the hands and feet respond at different rates. A key ribbon

observe the qualitative character of the examinee's performance and to make notes thereon. The author considers as an important feature of this duplicating the responses used in operating the car. The notation of observations on the quality of the performance by the examiner attains

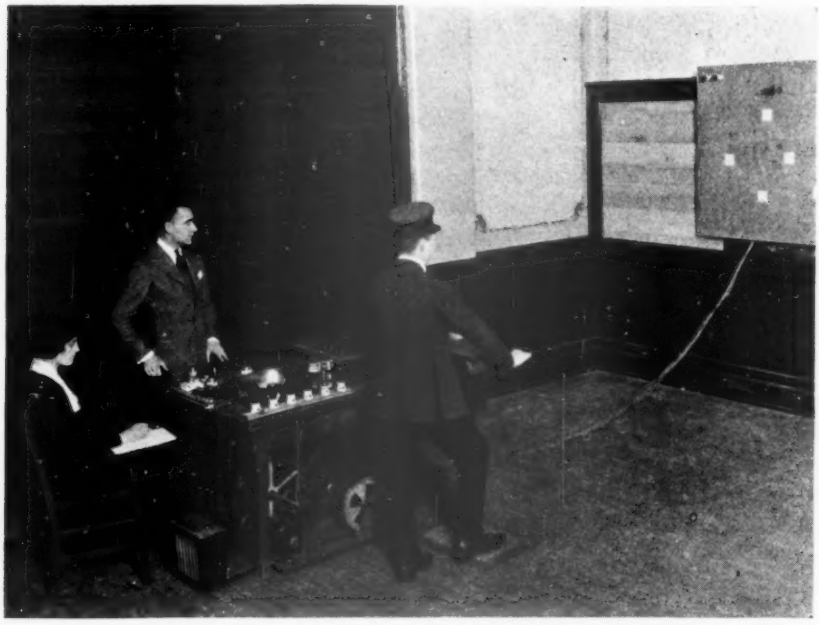


FIG. 3. THE VITELES MOTORMAN SELECTION TEST

test the fact that the applicant employs, in reacting, approximately the same set of muscles that are used in actual street car operation without greater importance by virtue of this fact.

with the correct responses makes scoring easy and rapid.

The author is responsible for the conception and the general characteristics of the automatic operating and recording devices, but credit for their mechanical construction belongs to Dr. Arthur J. Rowland and W. D. McCarter of the Milwaukee Electric Railway and Light Company.

Another improvement has recently been added in the form of a device designed to show reaction time under emergency conditions. This will be described in the succeeding article by Sadie Myers Shellow, who is responsible for this addition to the test.

OTHER TYPES OF TEST

The test just described was devised to measure only the factors involved in safety in street car operations under usual running conditions and in the emergency (exclusive of judgment of distance and speed) discussed in the latter part of section 1 and in section 2 above, of the *duties and abilities of the motorman*. Experimental work has been done in the measurement of other factors of importance in street car operation, such as temperamental traits involved in recklessness, and in maintaining pleasant relations with the

(Preliminary investigation, 1921)

FORM M-104

DIRECTIONS: This is a test of common sense. Below are sixteen questions. Four answers are given to each question. You are to look at the answers carefully; then make a cross (x) on the line before the best answer to each question, as in the sample:

Sample:
If you couldn't swim and fell into the river, what would you do?
X Yell for help and try to scramble out.
—Dive to the bottom and crawl out.
—Lie on your back and float.
—Take your coat off.

Here the first answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

1. If your trolley car ran off the track what would you do?
   —Try to run on the street.
   —Call the fire department.
   —Call the emergency truck.
   —Try to lift the car back onto the track.
2. If you were a passenger and fell asleep on a train and rode past your station, what would you do?
   —Pull the bell rope and stop the train instantly.
   —Tell the conductor to take you back.
   —Get off at the next stop and take another train back to your station.
   —Jump off and walk back.
3. If a child started running out into the street after his ball a short distance in front of the car what would you do?
   —Notify the conductor.
   —Ring the gong vigorously.
   —Speed up the car.
   —Make an emergency stop.
4. If a passenger asks you to speed up your car so that he can catch the car ahead, what would you do?
   —Speed up the car so as to satisfy the passenger.
   —Tell the passenger to ask the conductor.
   —Decrease the speed of the car.
   —Refuse to comply with the request of the passenger.
5. If a passenger bawls you out when you don't deserve it what would you do?
   —Call the conductor to help put him off the car.
   —Shout back at him.
   —Say nothing at all to the man but report the incident to your superintendent.
   —Explain quietly to the man that he is wrong.
6. If an intoxicated man was annoying the passengers in your car what would you do?
   —Put him off the car.
   —Pay no attention to him.
   —Turn him over to the nearest officer.
   —Report to the train despatcher.
7. If you felt that you were not being treated right as an employ of this company what would you do?
   —Take it up with your Labor Adjustment Committeeman.
   —Complain to your friends about the company.
   —Do nothing at all.
   —Quit your job.
8. If your car is held up by a fire what would you do?
   —Wait until the fire was put out.
   —Call the train dispatcher to ask what to do.
   —Ask the firemen what you should do.
   —Reverse ends and go back on the same line.

FIG. 4

public; in the measurement of the ability to profit from experience in foreseeing movements of traffic, etc. An examination has been made of the relation of general intelligence to safe street car operation. In the preliminary investigation, in addition to the *Viteles Motorman Selection Test*, the following tests were used:

1. *Dearborn Non-Verbal Test General Intelligence*
2. *Morgan Mental Test*
3. *M-104. A Common-sense Judgment Test.* This is a special test, devised by the author, involving largely situations familiar to street car trainmen. (Samples of these are given under figure 4.) Some of these situations call for a response involving only the exercise of judgment. In others a quality which, for want of a better term, may be called ethical discrimination, is involved.
4. *M-105. An Adaptation of Test 1 of the Pressey X-O Tests.* (See figure 5.)
5. *M-106. An Adaptation of Test 4 of the Pressey X-O Tests.* (See figure 6.)

Both of these tests are of use, according to Pressey[9] "for investigating the emotional, or the 'characterological' factors which influence behavior." They are devised to test the non-intellectual, or temperamental aspects of personality.

In the first test, M-105 "the words

FORM M-105

t.....d.....

DIRECTIONS: Read through the twenty-five lists below and cross out everything that you think is wrong—that a person is to be blamed for. Cross out as many or as few words as you wish; but be sure to cross out everything that you think is wrong.

1. begging swearing smoking flirting spitting.
2. fear hate anger jealousy suspicion.
3. dullness weakness ignorance innocence meekness.
4. careless fussy reckless silly childish.
5. poor extravagant sporty shrewd bad-mannered.
6. clumsy slang blues dancing snob.
7. thief prostitute grafter thug gambler.

22. church-going fasting cards quitter over-eating.
23. stubborn speculating gossip pity greedy dissatisfaction.
24. boasting nagging persecute money overdressed.
25. teasing sneering tricky brutal insane.

FURTHER DIRECTIONS: Go through the lists again. *Do not change any of the marks you have already made.* In addition to these, draw a line, around the *one* thing in each list that you think is worst. If there is nothing in the list which you think is wrong, draw a line around the thing which you consider least good. Work rapidly; but be sure you have a line around one, *and only one* word in *every* list.

As soon as you have finished this test write your badge number on the line below:

Badge No..... Date.....

Then hand this paper to the examiner.

FIG. 5

[9] *A Group Scale for Investigating the Emotion.* S. L. Pressey. Journal of Abnormal Psychology, April, 1921, pp. 55–64.

are grouped as unpleasant because of their relation to the emotions of disgust, fear, sex-feeling and suspicion." There is also a joker in each line. The jokers are used to determine whether the directions are understood.

"The scores in this test consist of the number of deviations from the most commonly chosen worst act and the most frequent sin. The idea has been that it might be illuminating to set over against each other, moral and intellectual or experiential judgments in this way. The test is an attempt to put in reasonable and objective form an ethical discrimination test."[10]

The second test, M-106, has in it words associated with five types of emotional disorder, hypochondriacal, paranoid, neurotic, excess of self-consciousness, and melancholic. The possibility of isolating temperamental types by a consideration of the words encircled by those examined was thought to make an interesting point of departure in the measurement of temperamental traits of importance in successful street car operation.

FORM M-106

t.....d.....

DIRECTIONS: Read through the twenty-five lists below and cross out everything about which you have ever worried or felt nervous, or which you have ever dreaded. Cross out as many or as few words as you like. But be sure you cross out everything which you have ever worried about.

1. injustice noise self-consciousness discouragement germs.
2. clothes conscience heart-failure poison sleep.
3. sickness enemies money blushing failure.
4. falling queerness religion dizziness boss.
5. sin operation conspiracy lightning marriage.
6. neighbors accidents impulses suicide disfigurement.
7. fainting influences nightmares emotions God.

FURTHER DIRECTIONS: Go through the lists again. *Do not change any of the marks you have already made.* In addition to these, draw a line around the *one* thing in each list about which you have worried the most. If there are lists in which there is nothing about which you have worried, draw a line around the thing you would be most likely to worry about. If you are not sure, guess. Work rapidly; but be sure you have a line around one, *and only one* word in *every* list.

As soon as you have finished this test write your badge number on the line below:

Badge No..... Date.....

Then hand this paper to the examiner.

FIG. 6

THE PRELIMINARY EVALUATION OF THE TESTS

In the preliminary study in the selection of motormen by means of tests, reported in the present article, the above named tests were given to 130 men. The examinations were made in the Fall of 1921. All those examined were men hired during 1920, stationed at three district car stations. (The total number of men employed during 1920 was 200.) This group was

[10] *First Revision of a Group Scale Designed for Investigating the Emotions, with Tentative Norms.* S. L. Pressey and O. R. Chambers. Journal of Applied Psychology, March, 1920, Vol. 4, pp. 97–102.

selected, first, because they were the younger men who could be expected to react more graciously to the testing process than older men, and secondly, because all the men in this group had approximately the same amount of experience on the cars.

All of these men took the *Viteles Motorman Selection Test, M-104, M-105* and *M-106*. Ninety-seven of them were given the *Dearborn Test* and the remaining 33 the *Morgan Mental Test*. All of the tests except the first were given as group tests. Groups comprising about 30 men were assembled in the recreation room of the car station. In each case short talks explaining the purpose of the investigation were given by the superintendent of transportation and by the examiner. Following this the group tests were given, and later each of the men appeared at a stated time for the individual examination. Each man was paid for the time spent in taking the examination.

The results from only 85 of these men are included in this report. The results of 30 other men examined are not considered because standard procedure in giving the *Viteles Motorman Selection Test* was not developed until this number had been tested. Four cases are discarded from consideration because of departures from standard procedure during the examination of these men on this test. Five cases are discarded by reason of the absence of gradings by supervisors; three cases because of irreconcilable differences in the ratings of supervisors, and one because the motorman was rated as *reckless* by all the supervisors who rated him. (The *Motorman Selection Test* is not designed to test recklessness.) In one case there is no record of the examination on the *Motorman Selection Test*. In another case which has not been included in the statistical treatment of results no record of the reason for a notation made by the examiner to discard from treatment appears on the examination blank.

CRITERIA OF ABILITY

Rating by supervisors and motorman instructors

Each motorman was rated on eleven traits by all the supervisors and motorman instructors who knew him. The form on which these ratings were made is shown in figure 7 (Form R-2).

The ratings were made at a group meeting of motorman instructors and supervisors at each car station. The meaning of each trait upon which a rating was to be given, and the method of rating were carefully explained. Each of the supervisors and instructors was then given a rating slip for each man who had been examined and told to rate those whom he knew well enough to make his rating significant. In this way from two to eight ratings were obtained for each motorman. Both the average number of ratings and the median number of ratings are 4.

The traits selected for rating are those which are of importance in successful street car operation. Only certain of these were used in the statistical analysis of the test results. The rest were included both for the purpose of furnishing data for future use and in order to force the raters to make a careful analysis of each man,

in the belief that the reliability of the individual supervisor's rating on the traits significant for this investigation would thereby be raised.

FORM R-2

RATING MOTORMEN

NAME..... DATE.....

BADGE NO..... LENGTH OF SERVICE.....

DIRECTIONS: Please rate the motorman named above on each of the characteristics listed below. Be sure to consider each characteristic separately and give the rating on that characteristic exclusive of the others. Consider the amount of training and experience which the man has had in rating him.

Be fair to the man, but if he deserves a low rating give it to him just as surely as you give the man who deserves it a high rating.

Put a cross before one word in each square to indicate your rating on each characteristic.

HANDLING THE CAR	ATTENDANCE	RELIABILITY
—Poor	—Somewhat irregular	—Unreliable
—Fair	—Fair	—Reliable
—Good	—Very regular	—Very reliable
ATTITUDE TOWARD JOB	SAFETY ON ROAD (Think of accident record)	APPEARANCE
—Slow in coöperation	—Reckless	—Careless
—Willing	—Fairly safe	—Neat
—Very willing	—Safe	—Very neat
	—Very safe	
KEEPING SCHEDULES	COURTESY (To patrons)	RELATION WITH FELLOW-WORKERS
—Poor	—Not courteous	—Poor mixer
—Fair	—Courteous	—Gets along well
—Good	—Very courteous	—Good mixer

INITIATIVE	PROMOTION
—Generally calls for help when in trouble	—Poor material for promotion
—Generally finds way out of trouble	—Fair material for promotion
—Seldom calls for help when in trouble	—Good material for promotion

If you were asked to give a summary of this man's ability how would you describe him? Use one of the following words, making a cross before the word which describes him most accurately.

—Unsatisfactory
—Barely satisfactory
—Satisfactory
—Very satisfactory
—Excellent

.....

Signature of Supervisor or Superintendent

FIG. 7

CHECKING VITELES MOTORMAN SELECTION TEST RESULTS AGAINST RATINGS

The motormen's scores on the *Viteles Motorman Selection Test* were compared with ratings on *Safety*. The results of this comparison are presented in graphic form in figure 8. The graph shows the degree of *Safety* in car operation, as rated by supervisors and motorman instructors, plotted as ordinates against the number of mistakes on the *Motorman Selection Test* plotted as abscissae. The figure placed on the ordinate before the rating shows the percentage of supervisors and motorman instructors giving the man the indicated rating. For example, the results of a man who is rated as *Safe* by two supervisors and as *Fairly Safe* by two others would be placed on the line marked $\frac{50 \text{ per cent Fairly Safe}}{50 \text{ per cent Safe}}$.[11]

The figures on the abscissae give the number of mistakes on the *Motorman Selection Test*. If the man referred to above were to receive a score of 6 on the *Motorman Selection Test* his results would be indicated by a cross placed at the intersection of the vertical line from 6 with the horizontal line from $\frac{50 \text{ per cent Fairly Safe}}{50 \text{ per cent Safe}}$. In this connection it must be kept in mind that *few mistakes on the Motorman Selec-*

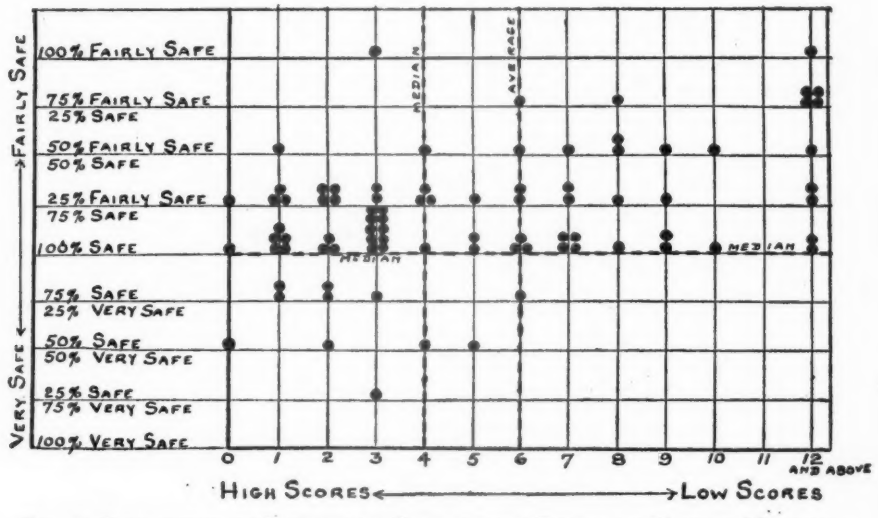


FIG. 8. COMPARISON OF RATINGS ON SAFETY WITH SCORES ON VITELES MOTORMAN SELECTION TEST (85 cases)

[11] In cases where ratings lay between the values given, the results were recorded on the line indicating the value closest to the exact value. For example, the results of a man who was rated as *Safe* by 66⅔ per cent of the supervisors who rated him, and as *Very Safe* by the remaining 33⅓ per cent would be recorded on the line for $\frac{75 \text{ per cent Safe}}{25 \text{ per cent Very Safe}}$.

tion Test represent a good score; many mistakes represent a poor score.

A study of the graph shows a marked tendency on the part of those rated as Fairly Safe by a majority of supervisors to grade low in the Motorman Selection Test and for those whose ratings are in the direction of Very Safe to grade high in this test. This tendency is shown even more clearly by a detailed analysis of the results.

The median rating is *100 per cent Safe*. The average number of mistakes made by the motormen on the *Motorman Selection Test* is 6. The median test score is 4, that is half of the men make 4 mistakes or less, while the other half make more than 4. More men make 3 mistakes than any other number. The minimum number of mistakes is 0, the highest number is 24.

Seventeen men are rated as *Fairly Safe* by at least 50 per cent of the supervisors. Of these, fourteen, or 82 per cent, have 6 or more mistakes in the test, 6 being the average for the group. Eleven, or 64 per cent, make 8 mistakes or more in the test, or as many as those made by the lowest 40 per cent of the entire group. Eight, or 44 per cent, make 9 or more mistakes in the test, or as many mistakes as the lowest 20 per cent of the entire group.

Eight men are rated as *Fairly Safe* by at least 75 per cent of the supervisors and as *Safe* by the remaining 25 per cent of them. Seven, or 87 per cent, of these have 6 or more mistakes on this test. Six, or 75 per cent, have 8 or more mistakes, or as many mistakes as the lowest 25 per cent of the group. Five, or 62 per cent, have 12 or more mistakes.

Thirty-five men are rated as *Safe* by 100 per cent of the supervisors. Only five, or 14 per cent, of this number have 8 or more mistakes, or as many as the lowest 40 per cent of the group. Only twelve, or 35 per cent, have 6 or more mistakes, the average for the entire group.

Five men are rated as *Very Safe* by at least 50 per cent of the supervisors who rated them. *All of these men have less than 6 mistakes, the average for the group.* Four of them have 4 mistakes or less. Three of them have 3 mistakes or less.

At the close of the preliminary investigation it was recommended that, provisionally at least, an applicant who made ten or more mistakes should not be considered for employment as a motorman. If the test had been so used in the selection of the 85 men whose results have been discussed, 12 of them would have been refused employment on the basis of *Viteles Motorman Selection Test* score alone.

Of these twelve men, ten, or 83 per cent, have less than a median rating on *Safety*. All ten are rated only *Fairly Safe* by one or more of the supervisors and instructors who rated them. One is rated as *Fairly Safe* by 50 per cent of the raters. Four are rated as *Fairly Safe* by 75 per cent of the raters and one is rated as *Fairly Safe* by 100 per cent of the supervisors and instructors.

In all nine men are rated as *Fairly Safe* by as many as 75 per cent of the raters. Of these six, or 66⅔ per cent, make less than a passing score on the test.

One man is rated as *Fairly Safe* by 100 per cent of his raters and

makes only 3 mistakes on the test. An examination of the man's accident record showed a disagreement between ratings on *Safety* and accident record. The average number of accidents per month and the percentage of accidents for which he was blamed by his division superintendent did not come above the average for the entire group. In a few other cases in which there appears disagreement between test score and supervisors' ratings, the accident record in some instances confirmed and in others did not confirm the ratings of the supervisors and instructors. The presence of such disagreements suggested the desirability of a search for other criteria of safety against which the validity of the test as a measure of the qualities involved in safe street car operation may be further checked.

Similar comparisons between test results and supervisors' ratings were made in the case of the other tests used in this investigation. The detailed results of these comparisons are presented in *Appendix A*. Below are given the results of a study of the relationship among the tests.

RELATIONSHIP AMONG THE TESTS

The four tests used in this investigation were compared with one another to determine to what extent they test the same or similar abilities. Practically no duplication was found. Statistical comparison of the test results gives an index known as an index of correlation. A positive index of correlation above 0.40, which is more than 4 times its probable error indicates that a significant relationship exists between the tests; in other words, that the same or approximately the same abilities are involved to a considerable degree in the performance of the two tests compared.

In table 1 are the correlations among the tests used in this investigation (Pearson).

TABLE 1

TESTS	INDEX OF CORRELATION	PROBABLE ERROR
Viteles Motorman Selection: Dearborn Test	+0.03	0.077
Viteles Motorman Selection: Morgan Test	+0.20	0.122
Viteles Motorman Selection: Judgment Test	+0.05	0.077
Judgment Test (M-104): Morgan Test	+0.13	0.094
Judgment Test (M-104): Dearborn Test	+0.05	0.095

A reference to these results reveals no significant correlation among the tests. That is, the tests are so designed that they test entirely dissimilar abilities.

The only criterion for determining whether these tests can be useful in selection is therefore the comparison of the particular test scores with standards of known accomplishments and personality traits of motormen.

General conclusions from the preliminary investigation

On the detailed statistical analysis of the results obtained in the preliminary investigation the following conclusions are based:

1. The various tests used in this preliminary investigation measure dissimilar mental abilities.

2. There was revealed a marked tendency for those rated as only *Fairly*

Safe to grade low on the *Viteles Motorman Selection Test*, and for those rated high on Safety to grade high on this test. The tendency was marked enough to warrant the conclusion that this test measures mental qualities of importance in avoiding accidents.

3. There were a small number of contradictions in individual cases between ratings on *Safety* and results on this test. An examination of these contradictions with reference to the accident records of the men involved showed, in certain cases, disagreements between the ratings of supervisors and accident records and agreements between test results and accident records. In other cases such disagreements did not appear.

Some of the contradictions might be due to factors such as illness of the man taking the examination, illness at home, stage fright, etc. These may influence a man's performance without coming to the attention of the examiner. Other contradictions were doubtless due to sources of error inherent in the test.

4. The results of the preliminary investigation revealed the inadvisability of using tests of general intelligence in the selection of motormen. There appeared to be no significant correlation between the scores on the tests of general intelligence used in the investigation and ratings on *Safety* or *Courtesy* or *Summary Rating on General Ability*. Motormen scoring high in the tests did not, in general rate high in any of these characteristics and vice versa. This finding is in disagreement with the *a priori* conclusions of Leeming[12] and Yoakum[13] with reference to the value of tests of general intelligence in the employment of competent motormen.

5. The comparison of the scores on the *Judgment test* (M-104) and supervisors' ratings on *Courtesy* and *General Ability* led to the tentative conclusion that this test could be used in the selection of motormen who have the ability to maintain pleasant relationships with the public and to meet problems involving judgment presented under ordinary running conditions. The analysis of the results showed a greater certainty that men making a high score on the test would be courteous motormen than that those making a low score would not be courteous. There was shown to be a relatively high probability that some potentially courteous motormen would not pass the test. The need of certain revisions in the test and further experimentation with it was indicated by the preliminary investigation.

6. The preliminary investigation showed that the *Personality Tests* (M-105 and M-106) were of no value in the selection of motormen.

7. The conclusion was drawn that the ratings of motormen instructors and supervisors cannot be accepted as satisfactory for a final check on the validity and reliability of these tests. Criteria must be sought which are less subject to the influence of personal

[12] *Necessary Physical and Mental Requirements of Platform Employees.* John Leeming. Electric Railway Journal, March 11, 1922, Vol. 59, No. 10, pp. 404 ff.

[13] *Standardized Methods of Employment.* C. S. Yoakum. Electric Railway Journal, April 22, 1922, Vol. 59, No. 16, pp. 679 ff.

biased judgment and capable of expression in more objective terms. It was decided that the next steps in this study must be evaluation of the ratings, preparation of these more objective criteria of success, and further evaluation of the tests in comparison with these criteria.

Such a study of the value of these scientific methods of selecting motormen, based on data from employees of the Milwaukee Electric Railway and Light Company, will be presented by Mrs. Shellow in the next number of this JOURNAL.

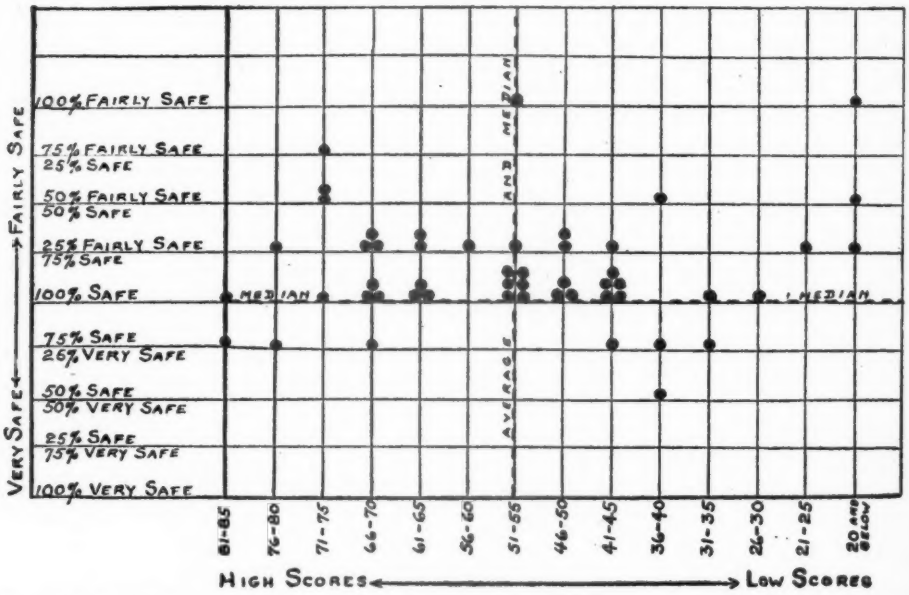


FIG. 9. COMPARISON OF RATINGS ON SAFETY WITH SCORES ON DEARBORN NON-VERBAL TEST OF GENERAL INTELLIGENCE

APPENDIX A

CHECKING INTELLIGENCE TEST SCORES AGAINST RATINGS

Dearborn Non-verbal Test of General Intelligence compared with ratings on safety

The scores of the 51 motormen who took this test were compared with ratings on Safety. The results of this comparison are presented in a graph similar to that used in evaluating the scores on the *Motorman Selection Test* (fig. 9). The graph shows the ratings on *Safety* plotted as ordinates against the scores on the *Dearborn Test* plotted as abscissae. As in figure 8 the dots show the number of men with the given test score and the given rating on *Safety*. *In this test the high scores represent the better scores.*

An examination of the graph shows that *there is no discernible relationship between the scores on this test of general intelligence and the safety of the individual motormen as revealed by ratings of supervisors and motorman instructors.* This is further brought out by a more detailed analysis of the results.

The average score of the 51 motormen who took this test is 53.2. The minimum score is 11 and the maximum is 81. The median score is 54; that is, half of the men make a score below 54, while the other half make a score higher than this.

The median rating is *100 per cent Safe.*

In all 7 men are rated as *Fairly Safe* by

at least 50 per cent of the supervisors who rated them. Of these, four, or 57 per cent, have a score of more than 53, the average of the group, and only two, or 33.3 per cent, have a score below the average and the median. Three, or 43 per cent, of this group have a score above 70, or as high as the score made by the highest 20 per cent of the entire group. Two, or 28 per cent received a score of 16 or below, or as low as the lowest 20 per cent of the entire group.

Thirteen are rated as *Fairy Safe* by 25 per cent of the supervisors. Of these, eight have scores above the average and have scores below the average and the median; three have scores above the average and the median.

Dearborn Test Scores compared with summary ratings on general ability

The results of this comparison are presented in graphic form in figure 10.

In this case the median rating is $\frac{\textit{75 per cent Satisfactory}}{\textit{25 per cent Very Satisfactory}}$.

Seven men are rated as *Barely Satisfactory* by at least 25 per cent of the supervisors. Of these, four received scores of average or above; three received scores

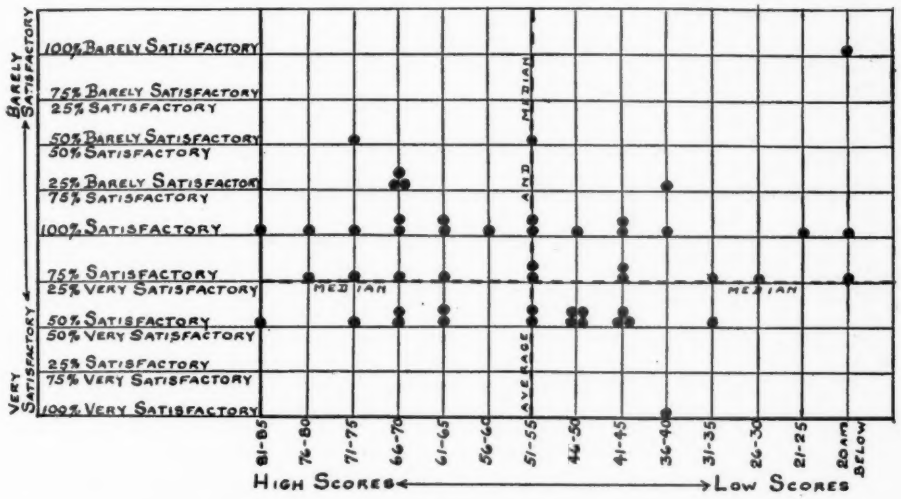


FIG. 10. COMPARISON OF SUMMARY RATINGS ON GENERAL ABILITY WITH SCORES ON DEARBORN NON-VERBAL TEST OF GENERAL INTELLIGENCE. (51 CASES)

only five, or 38 per cent, made scores below the average.

Twenty-four men are rated as *Safe* by 100 per cent of their raters. Twelve, or 50 per cent, have scores above the average, the remaining 50 per cent made scores below the average. Seventeen, or 71 per cent, made scores above 65, or as high as the highest 20 per cent of the entire group. Two, or 8 per cent, have scores of less than 36, or as low as those made by the lowest 20 per cent of the entire group.

Six men are rated as *Very Safe* by 75 per cent of the supervisors. Of these, three below both the median and the average. The highest score received by any of these men is 75; the lowest is 6.

Sixteen men received ratings of $\frac{\textit{50 per cent Satisfactory}}{\textit{50 per cent Very Satisfactory}}$. The maximum score of this group is 81. The minimum is 33. Only six, or 37 per cent of these men received scores above both the median and the average. The average score of this group is 54.7 or only 1.5 above the entire group which took the Dearborn Test.

These results show that, as in the case of Safety, *there is no relation between the success of motormen as expressed in ratings on gen-*

eral ability and scores on the Dearborn Non-Verbal Test of General Intelligence. The test does not differentiate between those who are rated as *Very Satisfactory* and those whose services have been *Barely Satisfactory.*

Dearborn Test Scores compared with ratings on courtesy

The outstanding facts revealed by this comparison are shown in graphic form in figure 11.

The median rating is *100 per cent Courteous.*

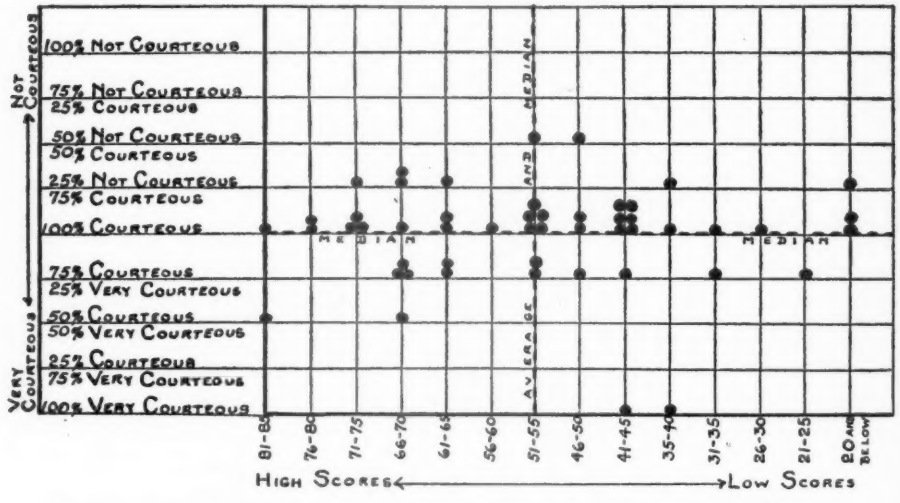


FIG. 11. COMPARISON OF RATINGS ON COURTESY WITH SCORES ON DEARBORN NON-VERBAL TEST OF GENERAL INTELLIGENCE (51 CASES.)

This graph shows that eight men are rated as *Not Courteous* by at least 25 per cent of the supervisors who rated them. Of these, four received a score of above 53.2 (the average for the group) on the test, and the remaining four received a score below this. The highest score obtained by any of the eight is 75, the lowest is 11. The average score of the eight is 53, or only 0.2 below the average for the entire group.

Fifteen motormen taking the Dearborn Test received a rating of *Very Courteous* by one or more supervisors. The scores of nine, or 60 per cent, of these are above 53.2, the average for the entire group. The scores of the remaining seven, or 40 per cent, are below the average. Only eight or 53 per cent, have scores above the median.

The highest score made by any motorman in this group is 81; the lowest is 23; the average score of this *Very Courteous* group is 54, only 0.8 above the average of the entire group.

The two men who are rated as *100 per cent Very Courteous* made scores well below the average.

These figures show that *the courtesy of this group of motormen bears no relation to general intelligence as measured by the Dearborn Non-Verbal Test.* The test does not differentiate between the discourteous and the courteous motormen.

Morgan Mental Test Scores compared with ratings on safety

Thirty-one of the eighty-five men whose results are reported in this paper were given the *Morgan Mental Test.* The average scores of these men is 67.8. The median is 69. The highest score made by any of these motormen is 124; the lowest is 6.

The median rating on *Safety* of these men is $\frac{25 \text{ per cent Fairly Safe}}{75 \text{ per cent Safe}}$.

The results of the comparison of scores

on the *Morgan Mental Test* with ratings on *Safety* are presented in graphic form in figure 12.

Three men are rated as *Fairly Safe* by 75 per cent of the supervisors. Of these two received scores considerably above the average; the other made a score below the average. The average score of these three men is 79.3, or 11.5 above the average of the entire group.

A comparison of the scores with reference to the median shows that one man received a score considerably above the median; one man a median score, and the third a score slightly below the median.

Four men are rated as *Fairly Safe* by 50 per cent of the supervisors. All four have scores below the average and the median. The average score of these four men was 37.5, considerably below (20.3) the average for the entire group.

Ten men are rated as *100 per cent Safe* (above the median rating). Of these four, or 40 per cent, have scores of median or below and six, or 60 per cent, have scores above the median. Four, or 40 per cent, have scores below the average, and six, or 60 per cent, have scores above the average. The average score for this group is 68.7, or nine-tenths above the average for the entire group. The maximum score is 97; the minimum is 22.

Two men received ratings of $\frac{50 \text{ per cent Safe}}{50 \text{ per cent Very Safe}}$. Both received scores well above the median and the average.

The one man who was rated as *Very Safe* by as many as 75 per cent of the supervisors received a score of 51, considerably below the median and the average of the entire group.

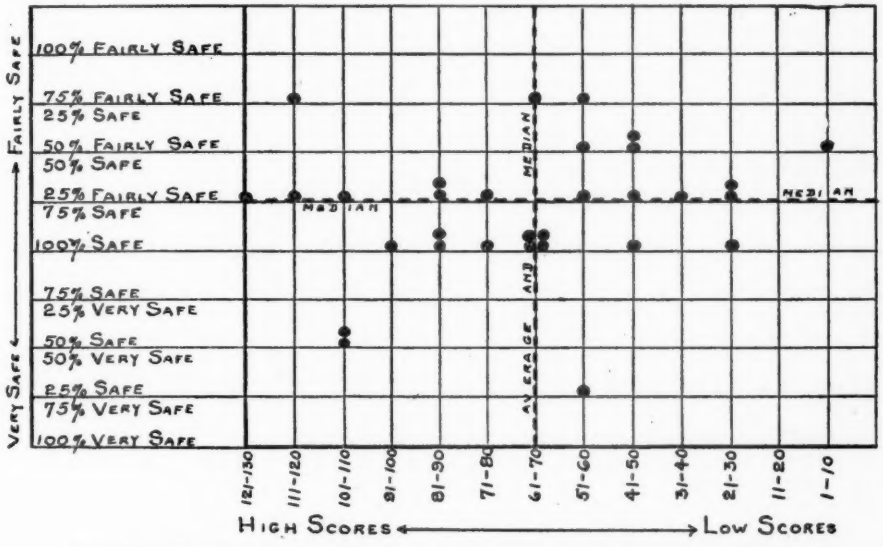


FIG. 12. COMPARISON OF RATINGS ON SAFETY WITH SCORES ON MORGAN MENTAL TEST (31 CASES)

There is a more pronounced relationship between ratings on *Safety* and scores on the *Morgan Mental Test* than there is between the ratings and the *Dearborn Scores. However, the relationship is not significant and hardly warrants the conclusion that the Morgan Test could be used in selecting those motormen who could best avoid accidents.*

Morgan Test Scores compared with summary ratings on general ability

In figure 13 is presented the comparison of *Morgan Mental Test* scores with *Summary Ratings on General Ability.*

The median rating is *100 per cent Satisfactory.*

The two men rated as *Barely Satisfactory* scores of both of these men are as high as those made by the highest 20 per cent on the *Morgan Mental Test.*

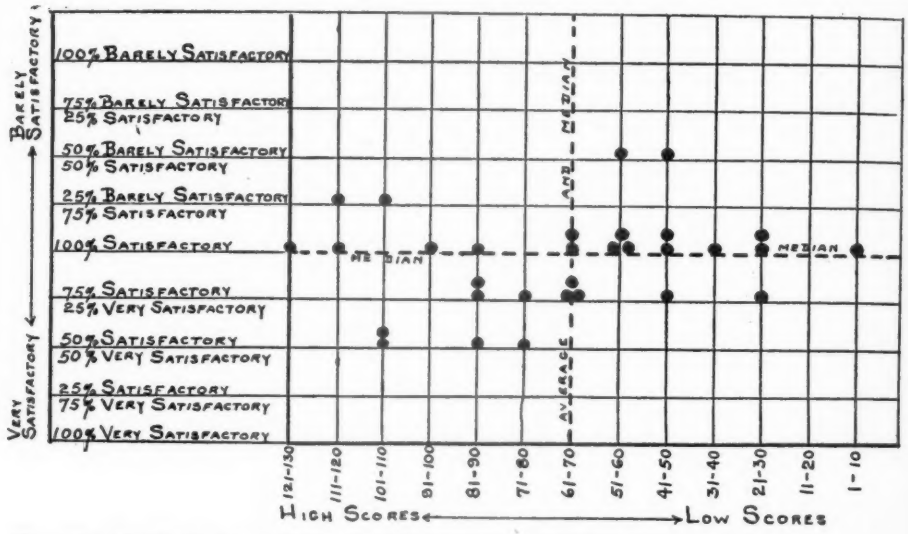


FIG. 13. COMPARISON OF SUMMARY RATINGS ON GENERAL ABILITY WITH SCORES ON MORGAN MENTAL TEST (31 CASES)

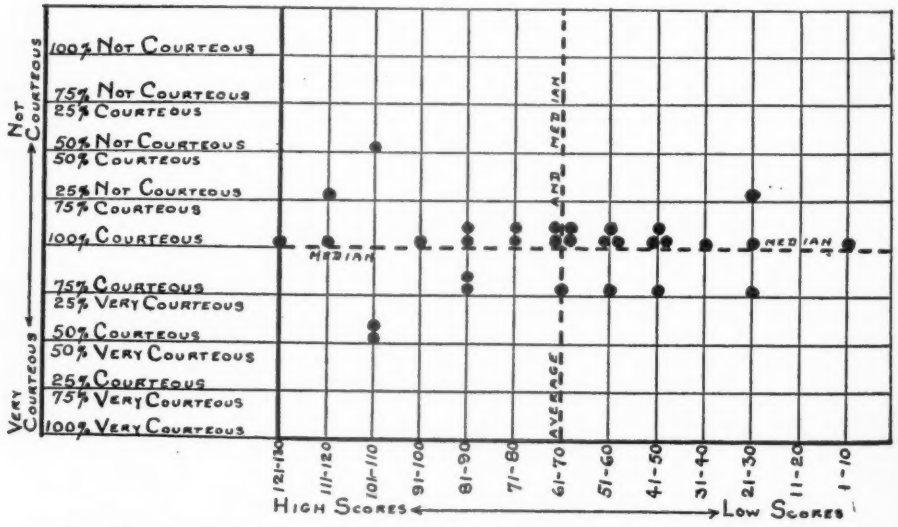


FIG. 14. COMPARISON OF RATINGS ON COURTESY WITH SCORES ON MORGAN MENTAL TEST (31 CASES)

by at least 25 per cent of the supervisors both have scores well above the median and the average. As a matter of fact the

Nine, of 64 per cent, of the 15 men who are rated as *100 per cent Satisfactory* received scores below the median and below

the average. The highest score made by any man in this group is 124; the lowest is 6.

Of the eight men who are rated as *Very Satisfactory* by at least 25 per cent of the supervisors, only three, or 37.5 per cent, received scores above the average. Five, of 62.5 per cent, received scores above the average for the entire group. The average score for this group is 66.2, or 1.5 below the average for the entire group.

All four men who are rated as *Very Satisfactory* by 50 per cent of the supervisors have scores above the median and the average, three of them being well above the median and the average.

Of eight men rated as very courteous by one or more supervisors, four, or 50 per cent, received scores above 69 (the median) and the remaining four, or 50 per cent, scores of median or below. Five, or 62.5 per cent, have scores above the average. The average score of this group is 70.2, only 2.5 above the general average. The highest score is 104; the lowest is 22.

However, the two men in this group who are rated as *Courteous* by 50 per cent of the supervisors both have scores well above the average.

As in the case of the Dearborn Test, *the Morgan Mental Test shows no clear differentiation between the Very Courteous and the Discourteous motorman.*

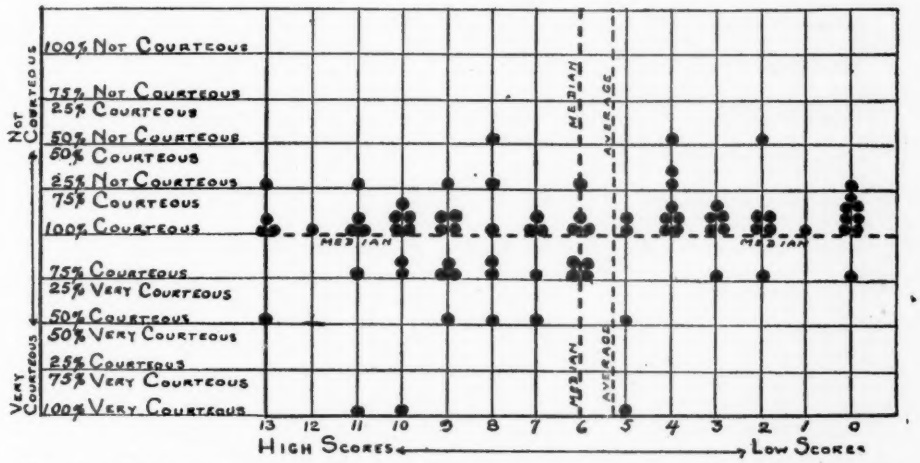


FIG. 15. COMPARISON OF RATINGS ON COURTESY WITH SCORES ON M-104 (JUDGMENT TEST) (82 CASES)

These results show that the relationship between General Intelligence, as measured by the *Morgan Mental Test*, and the success of motormen, as expressed in ratings on *General Ability* is somewhat greater than that between *General Ability* and results on the *Dearborn Test. However, the relationship is not high and does not warrant the conclusion that the scores on this test will predict, with any degree of reliability, the success of an individual applicant for employment as a motorman.*

Morgan Test Scores compared with ratings on courtesy

In figure 14 are shown the results of this comparison. The median rating is *100 per cent Courteous.*

Judgment Test Scores compared with ratings on courtesy

The *Judgment Test* (M-104) was designed to test judgment as employed in situations arising under usual running conditions and in maintaining pleasant relations with the public. It was not designed to test qualities which are of prime importance in avoiding accidents either under usual running conditions or in an emergency. The test scores were therefore compared only with ratings on *Courtesy* and with *Summary Ratings on General Ability.*

The results of the first of these comparisons are graphically presented in figure 15.

Ratings on *Courtesy* are plotted as ordinates against *test scores* as abscissae.

The graph shows a tendency for the higher scores to group themselves in the area of high ratings, and a less marked tendency for the lower scores to be grouped in the area of low ratings.

There are relatively very few cases with high scores in this test who are rated low on courtesy. There are a greater number of cases with low scores who are rated as courteous. This means that there is greater certainty that individuals making high scores on the test will be courteous motormen than there is that those making low scores will not be courteous. Acceptance of applicants with relatively high scores make more certain the selections of courteous motormen. The graph shows, however, a relatively high probability that some potentially courteous motormen will not pass the test.

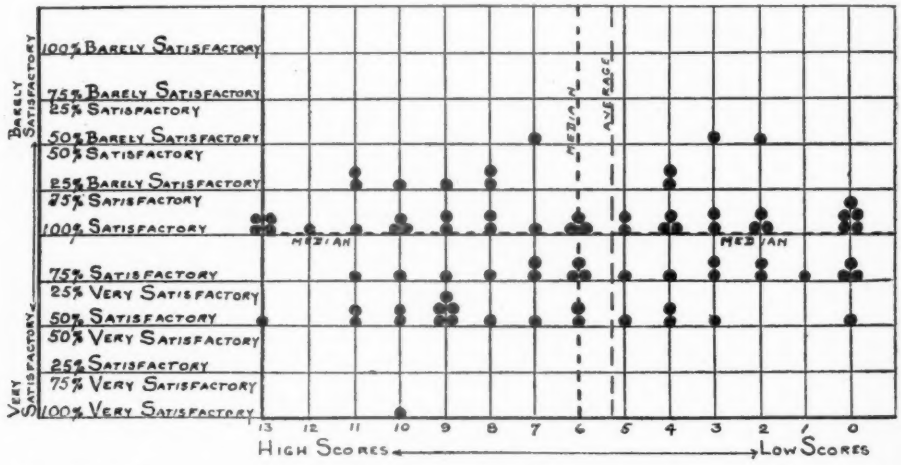


FIG. 16. COMPARISON OF SUMMARY RATINGS ON GENERAL ABILITY WITH SCORES ON M-104 (JUDGMENT TEST) (82 CASES)

The validity of these conclusions is shown further by the following analysis.

The highest possible score on this test is 16. The highest score made by any motorman is 13; the lowest is 0. Six is the median score and 5.3 is the average. Twenty per cent of the motormen make a score above 10. Twenty per cent make a score below three. The remaining 60 per cent had scores ranging from 3 to 9 inclusive.

The median rating is *100 per cent Courteous*. Eleven motormen were rated as *Not Courteous* by one or more supervisors. Six, or 55 per cent, of these have scores of median or below. The remaining five, or 45 per cent, have scores above the median. The highest score made by any of these men is 13; the lowest is 0. The average score is 6.2, or 0.9 above the average of the entire group. Five, or 45 per cent, of all the men, receiving ratings of *Not Courteous* made scores of 5 or less, or as low as the scores made by the lowest 40 per cent of the entire group.

Twenty-four motormen received one or more ratings of *Very Courteous*. Nineteen, or 79 per cent, of these received scores in the *Judgment Test* of median or above. The highest score made by any of these men is 13; the lowest is 0. The average score is 7.6, or 2.4 above the average score of all the motormen who took this test. Fourteen, or 58 per cent, of this group received scores as high as those made by the highest 40 per cent of the entire group.

Of the five men who are rated as *Very Courteous* by at least 50 per cent of the supervisors, four or 80 per cent, received scores above the median.

The significant features of this analysis are that the great majority of the men rating high on *Courtesy* received relatively

high scores on the test, and that the average score and range of scores of this more courteous group are higher than those of the entire unselected group.

In the interpretation of these test scores the influence of language ability must be considered. The procedure used in this test assumes also that he who uses good judgment in answering the questions will also use good judgment on the road. That this will always be the case is by no means certain. The temperamental factors discussed in another section of this article doubtless influence behavior. It is highly probable, however, that he who fails to exhibit good judgment in the test, by reason of a deficiency in this trait, cannot be expected to exhibit good judgment on the road.

Judgment Test Scores compared with summary ratings on general ability

The median rating is *100 per cent Satisfactory.*

Eleven of the eighty-two motormen who took M-104 receiving a summary rating of *Barely Satisfactory* by one or more supervisors (see fig. 16).

Seven, or 63 per cent, of these received scores in the *Judgment Test* above the median; four, or 47 per cent, received scores below the median in this test. The highest scores made by any one of this group is 13; the lowest is 2. The average score is 7.0, of 1.7 above the average for the entire group.

Thirty-nine of the motormen were rated as *Very Satisfactory* by one or more supervisors. Of these, nineteen, or 48 per cent, received scores above the median; twenty, or 52 per cent, received scores of median or below. The highest score is 13; the lowest is 0. The average score for this group is 5.4, or 0.1 above the average for the entire group.

This analysis shows that *there is no relationship between the scores on the Judgment Test and supervisors' ratings on the general satisfaction given by the motorman.* Although the test does differentiate to some extent between motormen who are courteous and those who are not courteous, it shows no differentiation between degrees of general success as indicated by ratings on general ability.

ANALYSIS OF RESULTS FOR TESTS M-105 AND M-106

In giving these tests it was found that the language ability which is involved in their solution made the tests very difficult for the men who took them. Many of the motormen failed to understand the instructions and others who understood the instructions complained to the examiner that they failed to understand many of the words used in the tests. The emotional reaction to these tests proved to be an antagonistic one. The men objected strenuously to encircling a word in a line in which they found no objectionable concepts or in which they found nothing about which they had ever worried.

In spite of the difficulties in giving the test, the results of 86 of the 130 men who turned in these examinations were subjected to a preliminary statistical analysis. In view of the difficulties experienced in giving the test and the time required to make a very thorough analysis the study of the test results could not be a detailed one.

The results of this analysis will not be reported here. *It is enough to state that the experience in giving the test and the preliminary analysis showed the inadvisability of using the tests in future experimental work. The analysis showed very definitely that the tests have little or no significance in the selection of motormen with temperamental traits favorable to success on this job.*

Book Reviews

EMPLOYES' REPRESENTATION IN STEEL WORKS

By Ben M. Selekman. New York: Russell Sage Foundation, 1924. Pp. 293

REVIEWED BY C. S. YOAKUM

This is one of a series of studies being made by the Russell Sage Foundation through its department of industrial relations, of efforts to bring employer and employe together for the betterment of industrial conditions. This study deals with the so-called Rockefeller Plan as it has operated in the steel works of the Colorado Fuel and Iron Company. It will be remembered that during the strike difficulties of 1913, John D. Rockefeller, Jr. called in W. L. Mackenzie King, former Minister of Labor and later Premier of Canada to suggest a plan by which recurrences of the labor difficulties might be prevented. The plan of organization thus developed embodied the "principle of representation" and is known as the Industrial Representation Plan. It was established in the coal mines of the Colorado Fuel and Iron Company in October, 1915, and in the Minnequa Steel Works in 1916. Conditions in the steel works were peaceful at the time in contrast to the earlier disturbed situation in the mines.

The report gives a description of the plant, the nature of the steel industry, the general working conditions, and shows the effects of the United States Steel Corporation on the activities of smaller companies.

The investigator planned "in advance to interview both employes and company officials, to familiarize himself with working conditions, to examine the procedure in carrying out the representation plan, and to consult all the available documents on the subject, including minutes of meetings, correspondence and reports." The first visit of Mr. Selekman lasted from November, 1919, to April, 1920. The general steel strike had been in progress for several weeks and the men were just returning to work. Mr. Selekman returned to Colorado in 1921 to check up evidence collected in the first interview. A preliminary report was submitted to officers of the company, and to a representative of the United Mine Workers of America, and as a result of differences of opinion, Miss Mary Van Kleeck, Director of the Department of Industrial Studies also went to visit the mines. She spent some time in the steel works.

"After revision of the manuscript, to include the new material gathered by Miss Van Kleeck, the galley proof was submitted to President John L. Lewis and other officers of the United Mine Workers and to representatives of the union from Colorado, who approved it as a whole. It was also submitted to the officers of the company and to Mr. Rockefeller, and we regret that after giving full consideration to their objections many differences of opinion as to interpretation and conclusions still remain." (p. 33).

I have quoted the above because the title of the volume before me is "Employes' Representation in Steel Works" and the reviewer is somewhat at a loss to know why the statement appears in this volume or, if the material on the steel works was submitted to the mine unions what the relevancy of their approval might be. The evidence on the points of difference, apart from this question, as they appear throughout the volume, between the investigators and the officials of the steel company seem to point to an *ex parte* representation by the author. Theoretically there ought to be an equal number of differences of opinion pre-

sented by the employes and by the officials after adding up the disagreements cited in a report of this type. These differences should apply only to matters of opinion, there should be no differences of fact. If any differences of fact still exist after both sides have expressed their views, such matters cannot enter into an evaluation of the representation plan. So long as they are data only in the minds of the investigators, they should not be used as material for forming an opinion. It is true that in certain cases it is almost impossible to establish the original fact. In such a case (see pp. 117–119) the investigators properly report the present attitude of both sides. The evidence here is simply that at the present, the two parties are not in agreement, and the interference is that there was not proper functioning of the plan in the case cited.

About six months after the plan went into operation in the steel works, agitation and discussion began for the introduction of the eight-hour day. The original memorandum of agreement upon which the representation plan was based brought out the fact of the dependence of the company on the action of its competitors and stated for the management that the schedule of hours would not "at any time be less favorable to the employes than the hours of labor in similar operations conducted by the company's competitors." At the meeting where an employes' representative spoke in favor of the eight-hour day, President Welborn took a similar stand. The minutes are quoted by the author as follows: "Mr. Welborn shared the views of (the representative who had spoken) in regard to the eight-hour working day, but stated from the standpoint of competition, the company could do nothing in the way of reducing its working hours at the plant until some similar action had been taken by the United States Steel Corporation." Continued pressure from the employes obtained the eight-hour day by November 3, 1918. The author states, "it would be difficult for us to exaggerate the enthusiasm of the Minnequa steel workers for the shorter working day of eight hours." (p. 85). What happened after the introduction of the eight-hour day? The employes are quoted as enthusiastic, and President Welborn is quoted as writing, "The immediate results from the standpoint of production per man-hour and of labor cost per unit of output were statisfactory and where conditions have been comparable it has been evident that we have lost nothing either in producing cost or output by reason of the change."

The factors cited by the author as facilitating this change are, (1) the proportion of English-speaking Americans is greater than is the case in eastern steel plants, (2) trade-unionism was beginning to exert an influence in the direction of shorter hours, (3) the management was favorable because it had few orders on its books at the time and the 10 per cent increase asked for by the employes was less than the workers would have received under the basic eight-hour plan (pp. 88–89). On page 86, to quote, "Even those among the employes who criticized the plan severely for other reasons readily declared that had it not been for the plan and the spirit shown by the higher officials of the company, the Minnequa steel workers would have received only the same working day as was granted to the employes of the United States Steel Corporation. They would have continued to work, in normal times, the twelve-hour day."

The summarizing chapter at the close of the book does not list any advantages of the plan accruing to the management. Neither does there seem to be any in the quotations just cited. If the reviewer is to hold a balance in this respect, he must judge that all advantages accrue to the workers, for some such reason as that they are in need of more advantages and that their need is more acute. This is not an argument for the employer or for management. There are doubtless many reasons, and good ones, why this should be so in the steel industry. Nevertheless, Mr. Arthur H. Young, speak- before the second bi-monthly conference of the National Association of Employment Managers, December 13, 1919, pp. 40–50, gives us a contrasting picture of management satisfied with the workings of the International Harvester plan. A sketch of the closing of the Wisconsin Steel Works located in South Chicago by the Works

Council during the strike of 1919 is given on page 44 of this conference report. We venture to quote a few lines. "I wish there were space for me to quote from the minutes of that Works Council the statements of the employe representatives—some of them union men—telling how and why they and the men they represented had reported for work. To my mind those minutes and that experience are striking testimony, not only as to what has been, but as to what can be accomplished by frank, fair, genuine, fifty-fifty, industrial coöperation. They make it clear that those men braved the perils of the menacing situation solely because they were loyal to their employment and to their Works Council." Clearly no such situation as this existed in the Minnequa Steel plant at the time of the strike. It is not the purpose of the reviewer to contrast these situations in favor of either. It does seem evident, however, that there is either much less of balance in the plan as it operates in the Minnequa plant, or that conditions differ so that a far more favorable situation is represented in the Wisconsin Steel Works, or that two persons with different sympathies are reporting the two cases. Pages 170 to 171 indicate that the employes felt themselves helpless. Page 168 indicates that the company officials were surprised over the completeness of the walkout. The reviewer is unable to find in the book an explanation of the lack of information on the part of the officials.

The author makes out a definite case for the values of such a plan and points out with clearness many of the weaknesses. He gives, except for the impression of partisanship left, an excellent statement of the working of such a plan. He points out the failures and suggests the need for more systematic personnel methods. The data used in negotiations, however, are presented in meager form. It would seem that the type of data used might have been presented to the reader.

The story is well told. The very clearness with which the situations are described makes more evident the points on which we would like additional information. Why are the minor officials opposed to the plan and always interfering with its operation? The villains in the plot go unpunished and unexplained. They do not even have a change of heart in the story. We shall look forward to further analysis of the situation and hope that the author, with the wealth of material he has at hand, will show why some plans operate smoothly and others do not. Have we group differences in the psychology of peoples, or simply differences of machinery? Is there a difference in persons when they are at the bottom in industry (compare report on the Dutchess Bleachery) and when they are in intermediate stages, as, perhaps, the Minnequa Steel Works?

PERSONNEL ADMINISTRATION: A BIBLIOGRAPHY

By William H. Rossi and Diana I. Powers Rossi. Baltimore: The Williams and Wilkins Company, 1925. Pp. 365

Reviewed by Robert F. Lovett

To personnel workers who have been looking for bibliographical aid this should prove a very helpful book. Entered in it are about 2750 titles on various aspects of personnel administration which have appeared from 1919 to January 1, 1924. The preface explains that this limited period seemed advisable since the Federal Board for Vocational Education and other authors listed in Section I: 1, have published selected reading lists on various phases of the work prior to this time. While not complete in itself this bibliography covers the entire field and includes, in addition to the well-known and more readily accessible publications, many valuable reports and studies of restricted circulation.

Nine main headings form the table of

contents: *Personnel Administration; Employment; Health and Safety; Education and Training; Research; Employee Service; Rewards; Administrative Correlation; and Joint Relations.* There is an index to authors with page references, and also an index of over 200 periodicals with publishers' addresses.

The book is an important adjunct to the rapidly growing field of knowledge about personnel administration, and simplifies considerably the library and reference labors of personnel workers. It is to be hoped that the compilers will carry out their reported intention of keeping the study up to date by annual supplements.

Abstracts

The Development and Administration of Classification and Compensation Plans in the State Service of New Jersey. C. P. MESSICK AND FRED TELFORD. Public Personnel Studies, April, 1925, Vol. 3, No. 4, pp. 122–130.

Traces the development of the merit system in New Jersey from its first beginnings in 1905 and 1906 to the present time. The New Jersey state law makes the merit principle extend to every department of the state government with so few exceptions that the great bulk of the public personnel is placed in the classified service and made subject to the civil service law.

In the early years of its administration the Civil Service Commission recognized that there was need for a more effective classification of positions and for the adoption of appropriate compensation rates applicable to the entire service. Data were secured regarding each individual position, particularly as to the title, authority, duties, compensation, hours of service, and lines of promotion; and class specifications were worked out for every position in the classified service. From these were developed the compensation schedules.

Results of the classification of the state service of New Jersey and of the standardization of salaries, as they appear at the end of the legislative session of 1925, are summarized by the author.

Teacher Examining and Related Work in Some Eastern States and Cities. J. B. SULLIVAN. Public Personnel Studies, April, 1925, Vol. 3, No. 4, pp. 114–121.

Sets forth examining, certifying and employing practices as they are found to exist in Virginia, Maryland, Pennsylvania, Delaware, New Jersey, New York and Connecticut and in the cities of Washington, Baltimore, Philadelphia, Newark and New York.

The investigator reports that teacher examining bodies in both states and cities, particularly in states, are in the main loosely organized and without adequate full-time staffs and without the powers needed to exercise the broad personnel functions which such a body theoretically ought to have. New York City is a notable exception to this and Philadelphia is much better equipped than most cities.

No formal classification or job analyses of teaching positions have been made in any of the jurisdiction studies, though a rather fine classification has been worked out and is used for examining and other purposes in New York City. Definitions of the duties of the positions leave a great deal to be desired. It will be noted too that there is no direct mention of the personal qualifications needed for the various classes of positions. "The conclusion is unescapable that the teaching profession is in need of a formal classification or job analysis which will provide a reasonable degree of specialization as a basis for granting licenses; that the duties to be performed, particularly in the case of vocational classes and supervisory positions, should be carefully stated and not inferred from titles, and that the statement of qualifications should include in addition to academic education and teaching experience the minimum and desired requirements in the way of abstract and social intelligence, knowledge of subject matter and teaching technique, personal traits (such as disposition, voice and tact), and the requirements as to health and physique which any good teacher ought to meet."

In regard to existing practices in examining teachers the author summarizes as follows:

1. The state examining bodies studied, instead of trying to secure better teachers through the use and improvement of formal

tests, are rapidly abandoning such tests as they now give.

2. The cities studied are using formal written, oral, and performance tests extensively for teacher examining purposes and are directing their efforts toward the development of better tests.

3. Either the states studied are making a mistake in abandoning tests, or practices in other fields, such as medicine and law, are wrong, or teaching is fundamentally different from some lines of work and the tests serve no useful purpose.

4. The cities studied might improve the effectiveness of their testing work by a wider use of standardized intelligence tests and written test in the short answer forms.

5. The examining force in both the cities and the states studied is, with the possible exception of New York City, in need of larger powers and greater financial support.

The Problem of the Basic Wage. PAUL H. DOUGLAS. University Journal of Business, December, 1924, Vol. 3, No. 1, pp. 1–17.

Under a family-allowance system, men are not to be paid fixed sums, but instead, amounts varying with the number of dependents they have to support. A basic minimum is set for single men. Before a decision can be reached as to whether or not it would be sound social policy to introduce a family-allowance system in this country, certain problems of detail and administration must be considered. In this article, the following conclusions are reached:

1. Both the basic wage and the allowances should be computed in terms of the subsistence-plus, or the minimum health and decency standard of life.

2. The cost of living for a single man living away from home plus a liberal allowance for saving is the correct theoretical minimum for men's wages under a family-allowance system.

3. The basic wage for women should be fixed upon the cost for a single woman living away from home. Allowance for saving should be added as in the case of men.

4. Both because of the slight necessity for wages regulation and the difficulties involved, it is better to allow the wages of juveniles to be set by individual bargaining.

5. In order to protect workers against their losses, a system of unemployment insurance is preferable to a flat increase in hourly rate. Lacking insurance, some provision for unemployment should be made in the base rate.

6. "It cannot be repeated too often that the basic wage is only a minimum. Not only will many of the more efficient unskilled laborers receive more than this amount, but all those in the more highly skilled trades will probably receive more as well. It is not an essential part of any family-allowance system, therefore, that the body administering the system should fix differentials to allow for skill, severity of effort, disagreeableness of the work, responsibility, etc. These can be adjusted in proportion to the base wage either by the management itself, or preferably by the management and the representatives of the workers who are concerned."

Vocational Tests. M. BOOLE STOTT. Women's Employment, London, February 6, 1925, Vol. 25, No. 3, pp. 7–8.

The Central Employment Bureau for Women, in conjunction with the National Institute of Industrial Psychology is making arrangements for giving psychological tests to any patrons who desire this service. For the first six months, at least, no fee for such testing will be charged.

This Bureau, after twenty-five years' service as an advisory body in regard to occupations, is convinced of the necessity for some better and more reliable method of dealing with questions of vocational fitness. Too many women have entered occupations for which they were not fitted because the work was easily secured, or socially accredited. Individuals do not often know the work for which they are best adapted. They know too little of the work and too little of their own abilities and character. Interest alone is not a safe criterion.

Students are urged to present themselves for testing while they are still in school or college, before they have completed some

specialized course and are ready for work. Beside the testing service the Bureau plans to do much work in the way of record keeping and statistics. Much material for statistical research is already on hand from the records of the 200,000 people with whom the Bureau has come in touch in the course of twenty-five years, and it is hoped that this will be of help in planning and organizing the new work.

A "Work-Limit" Timing Machine. MICHAEL WEST. Journal of Educational Psychology. April, 1925, Vol. 16, No. 4, pp. 275–277.

Outlines some previously used methods of timing work-limit group tests in which part of the score consists of the time required to complete a certain task, and then describes a new machine that provides an automatic system of time recording which makes it possible for one person to conduct tests, as in the case of practice classes, in which several work-units are done in a single period. Without going into much detail the experimental work is described until the final form was adopted. It consists of three revolving dials, each one being actuated by a solenoid. It is quiet, capable of giving any time-unit required, and can readily be set back to zero.

The Measurement of Fundamental Character Traits by a New Diagnostic Test. ROLAND C. TRAVIS. Journal of Abnormal Psychology and Social Psychology. January–March, 1925, Vol. 19, No. 4, pp. 400–420.

Character is defined as a person's "exhibition of responses and reactions to inner stimuli and to objective perceivable situations." The Diagnostic Test was devised for the purpose of gaining insight into the character and personality of the subject.

The method of attack is to represent different personal attitudes, mental sets and objective situations in the form of simple concrete statements. Fifty psychological and psychoanalytic terms were chosen as character traits to represent a number of mental sets and personal attitudes. There are two statements in the test representing each trait, arranged in a form that tends to disguise the real intent of the test. The statements representing the fifty traits were chosen from a large number. Original examples were subjected to the judgment of seventy-five individuals as to their relative diagnostic value. Statements reacted to indifferently by these judges were eliminated. The one hundred that remained were then ranked in steps of relative desirability from 1 to 100 by seventy-five individuals. The composite rankings gave a basis by which they could be arranged in ten groups with ten statements in each group. Thus statements number 1, 11, 21, 31, 41, 51, 61, 71, 81, and 91, were placed in one group; statements number 2, 12, 22, 32, 42, 52, 62, 72, 82, and 92 in another group, etc.

Form A of the character test is thus composed of ten groups of statements with ten statements in each group. The test in this form makes it possible to compare the individual ranking with the normal ranking and thus give the individual ranking a score in terms of the deviation of the individual ranking from the normal ranking.

As a further check, Form B was devised in terms of likes and dislikes.

When taking Form A, the subject was instructed to put 1 before the statement in the group he likes best, 2 before the one he likes next best, etc. Group I contains the following statements;

( ) Change your opinion often
( ) Show off before people
( ) Feel that you are inferior to others
( ) Feel that you are master of your job
( ) Tell your troubles to other people
( ) Think before acting
( ) Take defeat with a smile
( ) Suffer that others may be happy
( ) Have reverence for a higher being
( ) Take a bath

In Form B, the subject was instructed to put L before the things he likes and D. before the things he dislikes. The statement most liked and most disliked in each group was to be underscored.

The reliability of the test was determined by repetition of Form A with the same individuals and by correlation with Form

B. Self-correlations averaged 0.94. Correlations between Forms A and B were high. (Correlation coefficients are not given.)

The validity of the test was ascertained by four methods. First, twenty intimate associates' estimates of three well known individuals were correlated separately with the individuals' rankings on the tests. These correlations were 0.49, 0.24 and 0.07. Second, the ratings by eight teachers of sixty-three pupils, on the traits represented in the test. The correlations between the teachers' estimates and the pupils' estimates was 0.19. Third, the correlation was obtained between scores on the Morgan Intelligence Test and on the Character Test for fifty children. The value of r was 0.11. Fourth, a comparison was made between the results of the test and case histories and analysis of the patients in a psychopathic hospital.

The author is of the opinion that the method used in the character test devised in this study, that is, stimuli in the form of concrete statements, is valuable for diagnostic purposes in the detection of mental conflicts and underlying mechanics of the personality.

News Notes

NEXT ANNUAL MEETING OF PERSONNEL RESEARCH FEDERATION, INC.

October 10, 1925, is the date fixed for the annual business meeting of the corporate members of Personnel Research Federation, Inc. The corporate members are the officially designated representatives of member organizations. The purpose of the meeting is to hear the annual report of the officers and to elect nine members of the Board of Directors. This annual meeting will be held in the offices of the Federation, 40 West Fortieth Street, New York, at 10 a.m. A meeting of the Board of Directors will be held at 2 p.m. of the same day for the purpose of electing officers for the ensuing year, passing on the budget and applications for membership, and deciding on fundamental matters of policy.

INDUSTRIAL RESEARCH PRIZES FOR COLLEGE STUDENTS

The interest of college students in human relations in industry has been stimulated this summer by the offering of several prizes for the best essays written on the basis of actual experiences of the students as laborers. One contest is sponsored by *The Nation*, in conjunction with Professor Jerome Davis of The Yale Divinity School, and is open to all college students of America, graduate and undergraduate, men and women, who continue their studies in the fall of 1925. The contestants must have worked for at least two months in the summer of 1925 in some industrial or agricultural pursuit as regular laborers. For the best account of experiences in the field of labor and interpretation of the industrial situation involved a prize of $125 will be awarded; second prize, $75; third prize, $25. The judges are Mr. Jerome Davis, Yale Divinity School, Yale University; Mr. William H. Johnston, President, International Association of Machinists; Mrs. Florence Kelley, General Secretary, National Consumers' League; Mr. Pierrepont B. Noyes, President, The Oneida Community, Ltd.; Mr. Oswald Garrison Villard, Editor, *The Nation*.

A similar contest, open to students in any department of Yale University, has been arranged by the Social Service Department of The Yale Divinity School. The prizes are, first, $125; second, $50; third, $25. The judges are Honorable James J. Davis, Secretary of Labor, or, The First Assistant Secretary of Labor; Mr. Raymond B. Fosdick, New York City; Mr Jerome Davis, Yale University; and Prof. Edgar S. Furniss, Yale University. The conditions for this contest suggest that each manuscript be a record of the experiences of the contestant together with a study of the psychology of the working force, and of the problem of the relations between capital and labor in the companies studied.

Ford Industrial Research Group for Yale Men

Through the personal interest and generosity of Henry Ford, the Ford Motor Company is experimenting this summer with a group of Yale men, known as the Ford Industrial Research Group. Fifty men, largely graduate students interested in the problem of industrial relations were chosen for the work. These men are paid five dollars a day for the first two months and six dollars a day after that. They have been assigned various kinds of ordinary factory labor in the Ford plant. From time to time they meet as a group to talk over mutual problems with foremen, superintendents, and others. For a part of the time most of the men are given a chance to work as assistants to the foremen so as to share in the problems of manage-

ment. The Ford Motor Company has provided a special supervisor for the group and the men themselves have also elected a leader. The United States Secretary of Labor, James J. Davis, has agreed to speak to them sometime during the summer.

NEW GERMAN JOURNAL OF INDUSTRIAL PSYCHOLOGY

"Industrielle Psychotechnik," the monthly journal founded last summer by Dr. W. Moede, of the Technische Hochschule at Berlin, improves with each succeeding number.

In its first issue (May-June, 1924) the announcement was made that the journal would publish only material in which psychology was applied to practical questions of commerce and industry. The editorial statement says: "The purpose of industrial applied psychology is the rationalization of all phases of business activity. This practical aim of increasing to the maximum the level of human efficiency is to be accomplished through the application of science to:

"*1. Placement.* Vocational guidance and the proper adjustment of worker to task, based on determination of the worker's abilities.

"*2. Training.* Systematic instruction of beginners in office and workshop, in order to give them thoroughly and with the least delay an understanding of the technique of their work.

"*3. Job Study.* Proper adjustment of tools and working conditions, as well as all other important methods of increasing efficiency by means of job studies. These include motion, production, and fatigue studies, and time and attention studies.

"*4. Sales Process.* The applied psychology of advertising has bearings on all phases of the selling process and brings about their proper coördination.

"Industrial applied psychology embraces the whole field of management, from the hiring of suitable people, through the process of training and the improvement of working conditions and job procedure, to the sale of the product.

"Frequent reports on the development of applied psychology as well as on activity in the separate industries and occupations will be made through the publication of original work by experimenters and experts, as well as through reviews of articles and books. Special emphasis will be placed on making known the best industrial practice and on a lively exchange of ideas between science and practice.

"Industrielle Psychotechnik will, as a central organ for human relations in business, emphasize the importance of man as the basis of business life. The application of technical science to commerce is incomplete as long as applied psychology with its emphasis on the human standpoint does not receive its proper attention.

"While rational management aims especially at business-like procedure and increase in production, industrial psychology achieves as well a general improvement in human welfare, since it builds its measurements on the abilities of the natural man."

The first volume, ending with the issue for December, 1924, included articles on the following subjects:

A study of the construction of typewriters in relation to the physiology of the typist, and an experimental study of tests for typists.

An application of the Taylor system to forestry, with special reference to the construction of axes and spades.

The effect of the intensity of lighting on the efficiency with which various reactions are made to laboratory apparatus.

A follow-up of tests previously devised for street railway motormen.

An analysis of dressmaking and tests for dressmakers.

A psychological study of the persons involved in two railway collisions.

Studies of tests for railway employees engaged in ticket selling and in shunting cars.

The high standard of its contributions already raises this journal to an important place among psychological publications. Its only weakness is the occasional publication of researches which although ingeniously planned suffer from an insufficient number of cases on which to base reliable conclusions. The illustrations of apparatus and tests are exceptionally good.

Industrielle Psychotechnik is published by Julius Springer, Berlin, W. 9. Price, five gold marks quarterly.

NEWS ITEMS

C. H. Stoelting Company, manufacturers of psychological and physiological apparatus and supplies, have recently removed to 418–428 North Homan Avenue, Chicago, Illinois.

SOCIETY OF INDUSTRIAL ENGINEERS

Cleveland convention, May 6 to 8

The Twelfth National Convention of the Society of Industrial Engineers was held in Cleveland, on May 6, 7 and 8. "Problems of Management Today" was the major topic for discussion. At the opening session Harry A. Hopf, President of the H. A. Hopf Company, New York City, discussed the scope and importance of management, attributing most business failures to faulty management. Nepotism, disregard for the human factor, and overconcern with maintaining the balance of power between heads of departments are, according to Mr. Hopf, frequent causes of the failure of management.

The hazards of an over-systematization were discussed by W. B. Ferguson, Production Manager, Newport News Shipbuilding and Dry Dock Company, Newport News, Va. He advocated watchfulness over record keeping systems and reports, as a means of eliminating unnecessary overhead.

On Thursday morning, a memorial meeting was held in honor of the late Frank B. Gilbreth, widely known for his contributions in the field of fatigue and motion study. Tribute both to the man and to his work was paid by Colonel W. G. Sheehan, President of the Society of Industrial Engineers, John Younger of the *American Machinist*, and A. B. Segur of Chicago. At the close of the meeting, the following resolutions in honor of Mr. Gilbreth were read: "The Society mourns his death as the loss of one to whom we looked for leadership, and one who had endeared himself to us individually by many kind and friendly deeds; the workers have lost in him a true and wise friend; the engineering profession, science, civilization, and humanity have lost in him a courageous and enterprising engineer."

The industrial relations group, which met Friday morning, considered problems of unemployment insurance and industrial pensions. After showing that neither the Ghent plan of voluntary insurance nor the English compulsory unemployment insurance scheme had had a steadying effect on industry, Bryce M. Stewart, Manager, Chicago Employment Department, Amalgamated Clothing Workers of America, asserted that the Amalgamated Clothing Workers' plan has a four-fold influence: (1) it gives workers a steady income and therefore steadies demand; (2) it provides management with an incentive to regularize industry; (3) it promotes the mobility of labor between operations and plants; (4) it supplies data for more scientific study of regularizing employment. Each industry tends to create its own labor reserve; but through organized exchanges a pooling of reserves may be effected. A system of exchanges is an essential part of an unemployment insurance scheme, so that benefits may be paid only when work is not available. Inertia often leads an employer to take on a thoroughly trained worker instead of training one of his own unemployed workers. If, however, he is obliged to pay unemployment insurance, he will prefer to train his own workers for a variety of occupations, which of course tends to increase their mobility. Statistics gathered as a by-product of unemployment may be used to regularize the industry. Firms submit records for determining the amount of benefits due to workers; but these same figures may be used to show man-hours worked, wages paid, and other data useful as a basis for planning and diagnosis, with a view to regularization of employment.

"Cost and Administration of Industrial Pensions" was presented by J. A. Morford of the National Industrial Conference Board. Industrial pension schemes are variously motivated, according to Mr. Morford. They may be intended by the employer (1) as a reward for service, (2) to attract good workers and reduce turnover,

(3) to secure good will, (4) to remove the superannuated worker in a humane way, (5) to prevent labor disputes. The humanitarian motive is usually present in varying degrees; and the desire to reduce turnover is important, although employers vary in their opinions as to the effectiveness of pension schemes in reducing turnover. There are two general types of pension schemes—contributory and non-contributory. Contributory schemes are least often found in private industry, but they are more common in public utilities and financial institutions. In contributory plans, the employer views skeptically provisions relating to return of the amount contributed by the worker in case of early death before all benefits due are paid, or in case of leaving the company. In determining pension liability, an employer must consider (1) labor turnover, (2) sex proportions, and (3) age composition of the working force. The usual pension age is 65 years for men and 55 years for women, with a service requirement varying from 20 to 30 years. The amount of a pension is usually based on the number of years of service and average earnings over the period of employment. There are, therefore, unpredictable elements in any pension plan. There are at present only 242 industrial pension schemes in the United States, and most of these have been instituted since 1910. The whole movement is still in an experimental stage.

At the research committee dinner meeting Friday evening, Dr. C. S. Yoakum, of the University of Michigan, spoke on "Future Research in Labor Management." Three general problems for research were proposed, (1) unemployment, (2) analysis of management, and (3) distinction between persons and commodities as factors in production. More specifically, Dr. Yoakum indicated the need for further analysis of the reserve of labor, seasonal employment, and the life cycle of the worker. Job analysis and job specification offer fruitful fields for research. We need also to devote further scientific study to the behavior of persons, motives, incentives, and, finally, to the nature of skill.

In a discussion of personnel problems at the Friday evening conference session, Charles E. Watkins, Personnel Director, General Motors Corporation, Muncie, Indiana, stressed the key position of the foreman in present large scale industry, where the relation between worker and employer is necessarily remote. Dr. Charles A. Lippincott, Manager, Coöperative Department, Studebaker Corporation, expressed his belief that the good will of the workers is an employer's best asset. This is not to be secured by paternalism. Men do not want gratuities. They must, by a slow process of education, themselves come to know the problems of industry.

Dr. Lippincott's thesis that the problem of human relations in industry can be solved only on an ethical basis found expression in one form or another in almost all of the papers read at the conference. If one may generalize from the opinions expressed at these meetings, management is recognizing increasingly that technical efficiency of the worker is not to be isolated as an engineering problem, but rather to be regarded as a human problem of uniting management and workers in common interest in a coöperative working unit.

TAYLOR SOCIETY

Spring Meeting May 14 to 16

An interesting meeting of The Taylor Society was held under the auspices of the University of Michigan at the Michigan Union, Ann Arbor, Michigan, May 14 to 16. More than 200 registered, there was marked interest throughout, and discussions were spirited as well as enlightening.

The first session was an inspiring talk by Colonel Kepple Hall, of the Joseph and Feiss Company, Cleveland, on "The Daily Problems in a Manager's Office." This session was organized primarily for students in theEngineering College and the School of Business Administration of the University.

The attitude of bankers toward industrial management in its broadest interpretation was brought out by H. I. Shepherd, Vice-president of the Guardian Trust Company, Cleveland, in a paper entitled, "A View of Industrial Management that Interests Both the Engineer and the Banker."

Conventional balance-sheets and income-expense statements are no longer considered adequate with which to judge the soundness of credit risks, and Mr. Shepherd described how banks use management experts to examine and pass upon their clients from the standpoint of organization and operation.

Sessions of particular interest were those on the automobile industry. Topics were varied but emphasis on the distribution question showed in which direction the paramount interest lies. T. J. Litle, Jr., chief of the engineering department, Lincoln Division, Ford Motor Company, in a paper entitled "Frequency of Change of Model," brought out the demoralizing effects of yearly changes of styles in automobiles. In the discussion, Prof. C. E. Griffin, of the School of Business Administration, University of Michigan, pointed out that depreciation because of yearly model changes brings the car-owner nearer and nearer to the point where the cost of repairs is more than the value of the car even to the scrap dealer. It is largely because of this stimulated depreciation that replacement demand has grown so rapidly the last few years. Yearly changes of model unduly increase the depreciation. E. J. Poag, of the Buick Motor Company, Flint, Michigan, estimated that by the end of 1927 there would only be twenty manufacturers of automobiles left, and, from the point of view of being among the twenty, it is imperative that a manufacturer do everything possible to maintain and improve his position.

"The Present State of the Art of Office Management" was the topic of a paper by W. H. Leffingwell, President of the Leffingwell-Ream Company, New York. There has been a tremendous proportionate growth in the number of office workers since 1880. The average efficiency in the office is only 50 per cent. Mr. Leffingwell believes that by the application of scientific methods to office practice one half of this great waste can be recovered. F. L. Rowland of the Lincoln National Life Insurance Company, Fort Wayne, Indiana, brought out that the problem of the office in many respects is the same as that in the factory but cautioned against too hasty applications of scientific management in the office.

Perhaps the most systematic paper and most interesting from the standpoint of management, and of the Taylor Society in particular, was that on, "Experimental Psychology in Personnel Problems," by Prof. C. S. Yoakum, of the School of Business Administration, University of Michigan. This is the third of the Taylor Society's continuing series of studies in industrial psychology. These studies have proceeded from the general toward the particular, the first (Cambridge, Mass., April, 1924) being concerned with the nature of industrial psychology, and the second (New York, December, 1924) with the importance in industry of total situation psychology with its psychiatric emphasis. This third paper makes a more detailed inquiry concerning the relationship of experimental psychology and personnel problems with emphasis on the classification and interpretation of personnel data.

Dr. Yoakum believes that with a better appreciation of the human factor, the problems of spoiled work, turnover, accidents, selection, promotion, etc., are open to solution. This better appreciation necessarily results in the recording of entirely different series of data than is now the usual practice.

AMERICAN MANAGEMENT ASSOCIATION

Conference of Production Executives, Chicago May 21, 22, and 23, 1925

The task of developing satisfactory extra incentive wage plans is a problem in industrial efficiency. But it is also a personnel problem. Consideration of technical matters such as time and motion study in order to determine standards, the use of the method of payment to make these standards effective, and adequate planning and scheduling of work in order that the worker's output may vary directly with his effort must be accompanied by a consideration of human problems such as the psychology of incentives, fatigue, and monotony in work.

It is for this reason that the recent Conference of the Production Executives' Division of the American Management Association on Extra Incentive Wage Plans is of interest to those whose chief work is to consider the human element in industry

as well as to those whose immediate task is to work for efficient production in an engineering or technical sense. This Conference was held at the Drake Hotel, Chicago, on May 21, 22 and 23, 1925.

The meetings were devoted largely to papers in which representatives from various companies told in detail the wage plans used by them, the reasons for the choice of these plans, the problems which arose in actual execution of the plans, and the results obtained. Time was allowed for a discussion of the points raised by each speaker. Such an exchange of experiences is a valuable result of conferences of this kind.

In addition to consideration of these particular cases, there were two papers of a more general sort. Dean Heilman of the School of Commerce, Northwestern University, spoke on "Profit Sharing," and Charles D. Lytle, Director of Industrial Coöperation, New York University, read a paper on "Mathematical Analysis of Extra Incentive Wage Plans." Both speakers made valuable contribution to the meetings. Mr. Lytle had prepared charts giving graphic representations of eighteen wage plans. These charts and his paper did much to clarify the discussions and should promote a more precise use of terms in the future. There has been much confusion—there was some at these meetings—caused by failure to analyze payment plans into their essential elements and to agree on the names to be applied to the several distinct methods of payment.

One entire afternoon was given to a Symposium on Extra Incentive Wage Plans. The following list of topics brought up for discussion at this meeting will give the clearest idea of the field with which the conference was concerned:

I. Selecting a Fitting Plan:

1. What are the problems peculiar to individual industries, peculiar to types of workers, and peculiar to the various plans?

2. Who should be responsible for selecting a plan?

3. How should it be fitted to an extended incentive program: pensions, insurance, profit-sharing, employee stock subscriptions, and non-financial incentives?

II. Installing and Modifying a Plan:

1. What is the proper organization for the installation and operation of a plan?

2. What should be the relation of the following to the installation and operation of a plan:

Works Manager or Superintendent, the planning department, the personnel department,employee representatives, etc.?

3. How can the workers be prepared for its introduction and how can their continued coöperation be secured?

4. How should the management be prepared for its introduction in respect to inspection, flow of work, maintenance of equipment, etc.?

5. What can be done when unskilled or semi-skilled workers on an extra-incentive wage plan earn more than skilled workers or foremen on a day wage or salary?

6. What is the effect upon the work involved regarding payrolls, time cards, timekeeping, cost records, inspection control, and other internal systems and control arrangements?

III. Measuring the Results of a Plan:

1. What is the effect on loyalty of workers, output, team work and coöperation, quality of output, labor turnover, absenteeism, health, waste, strikes, soldiering, earnings, unit costs?

2. What influence does it have on selling prices, market possibilities, potential purchasing power, etc.?

3. What influence does it have on the invention of labor saving equipment?

4. What influence does it have on improved planning and processes?

5. What formulas for measuring results can be developed?

At the dinner meeting on Friday evening, three speakers had been selected to present three general viewpoints. Prof. H. D. Kitson of Indiana University spoke from the psychological viewpoint, describing some experiments he has already carried out and outlining the field for future research. He indicated the aid experimental psychology may give industry and pointed out the coöperation necessary from industry if such research is to go forward. Victor Olander, Secretary of the Illinois Federation of Labor, spoke from

the workers' viewpoint. He urged that those primarily concerned with industrial efficiency should remember that the effect of their methods on the workers was the final and most important consideration. Frank P. Cox, Manager, West Lynn Works, General Electric Company, ably presented the case for industrial efficiency basing his argument on the greater plenty for all which has resulted and will continue to result from better methods of production.

The last morning of the conference was devoted to group meetings for the consideration of extra incentive wage plans for those employees to whom such plans have not been generally applied, such as inspectors, supervisors, office employees, maintenance force, and janitors.

COURSE IN MOTION STUDY AT THE GILBRETH LABORATORIES

Mrs. Frank B. Gilbreth of 68 Eagle Rock Way, Montclair, N. J., has announced that an autumn course in Motion Study will be given at the laboratories of Gilbreth, Inc., starting August 31, 1925, and will continue for sixteen weeks. This course consists of lectures and laboratory work designed to train plant executives and engineers to equip and operate Motion Study laboratories.

The mornings will be devoted to lectures and conferences. These will cover the development of science in management, the growth of Motion Study and some practical economics and applied psychology which are necessary to teaching in industry. Applications will be made in the field of selling as well as in the field of production. All aspects of scientific management that have to do with finding and installing better methods will be discussed, with special emphasis upon those that have a direct bearing on the special problems of those taking the course.

The afternoons will be devoted to practical instruction in Motion Study laboratory work on finding, installing and maintaining what Mr. Gilbreth called "The One Best Way to Do Work," considering the worker, surroundings, equipment and tools.

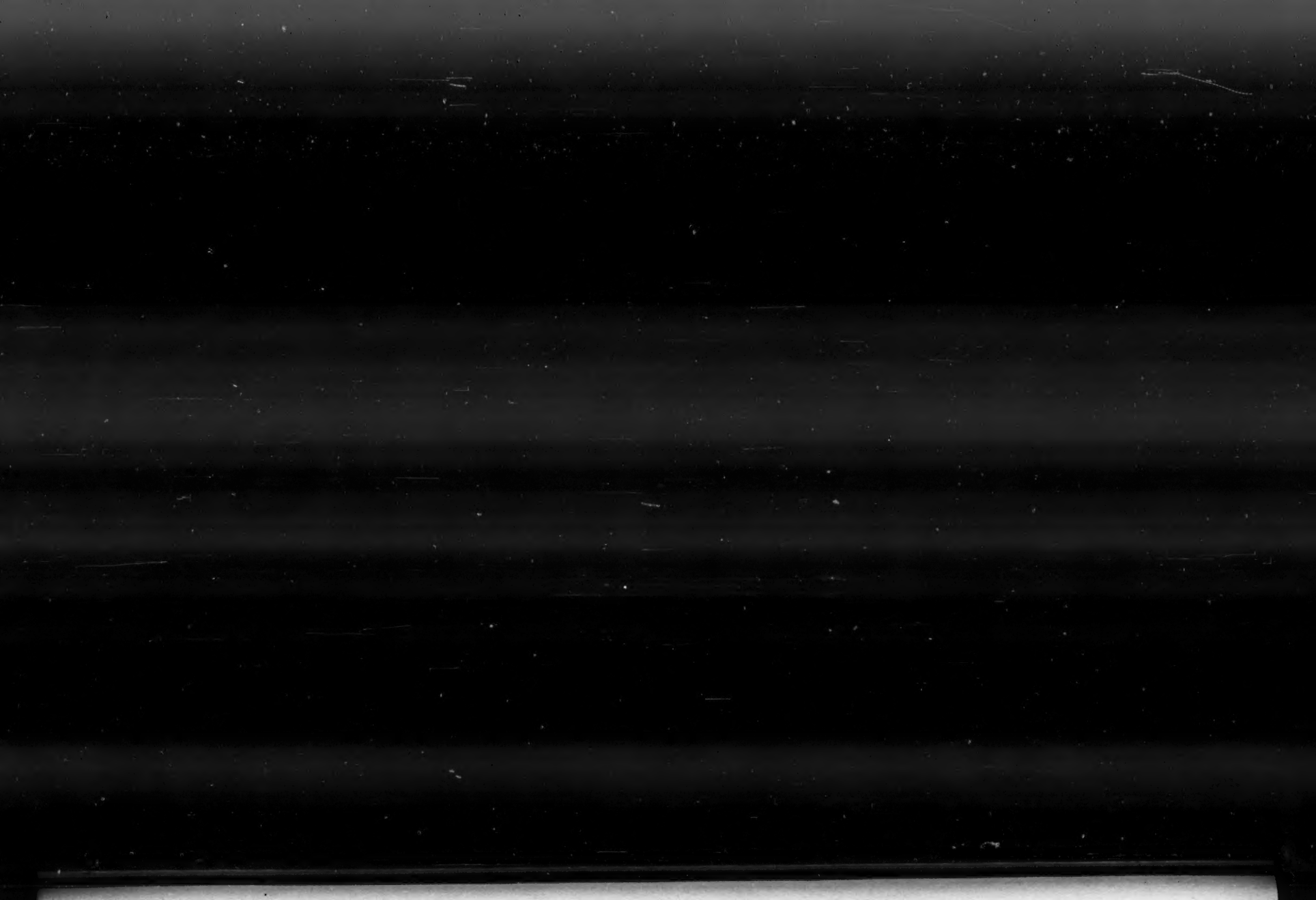
INSTRUCTOR IN PERSONNEL MANAGEMENT AT YALE UNIVERSITY

Edward Henry Reeves, a graduate of the University of Oklahoma, formerly a scientific assistant with the United States Public Health Service has been appointed instructor in personnel management at Yale. He has been assigned to the departments of engineering mechanics and administrative engineering in the Sheffield Scientific School.

DATES OF FORTHCOMING MEETINGS

The American Management Association will hold an important conference on Purchasing and Organization at the Hotel Astor, New York City, on October 15th and 16th.

The Production Executives' Division of the American Management Association will hold a second conference on Employee Representation in Kansas City on November 30th and December 1st.

The Sales Executives' Division of the American Management Association will meet in the Chase Hotel, St. Louis, on December 3rd and 4th.

The Fourteenth Annual Safety Congress will be held in Cleveland, September 28 to October 2.